Centre for Development Innovation

# Towards responsible scaling up and out in agricultural development

## An exploration of concepts and principles

Seerp Wigboldus
Cees Leeuwis

Discussion Paper

WAGENINGEN UR
For quality of life

CGIAR
RESEARCH PROGRAM ON
Integrated Systems for the Humid Tropics
led by IITA

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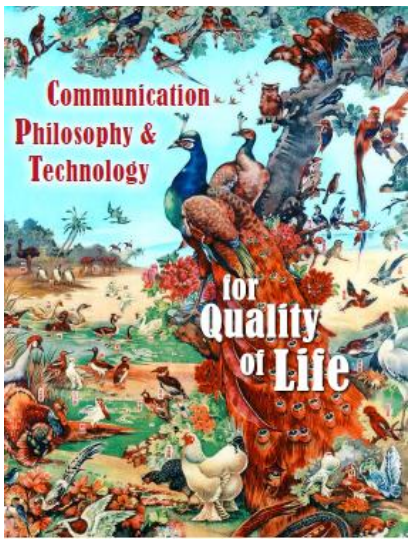


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Discussion paper prepared for the CGIAR Research Program on Integrated Systems for the Humid Tropics

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**Short summary**

Responsible scaling up and out is not just about technical feasibility, but also relates to different ideas on progress and development. This translates to different types of approaches to scaling up and out, which have been described in this paper as: push, pull, plant, or probe. Specific strategies for scaling up and out within such approach perspectives, will need to be tailor-made in relation to context specifics. For this, we do not in the first place need standards and guidelines, but individual and collective competences as well as conducive spaces for appropriate strategy development and implementation. We discuss a number of such competences.

**Photos**

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# Preface

This paper is meant to inspire discussions on the topic of processes of scaling up and out in agricultural development. It is a draft version that is intended to draw out feedback for further development towards a final version. Some of the text is experimenting with alternative models and interpretations to find out what helps most in moving towards responsible scaling up and out in agricultural development. The authors appreciate comments and suggestions on this draft.

The authors
Wageningen, September 2013

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# Executive summary

The idea of scaling (up and out) appears to be clear when we see how much it is used these days in proposals and plans. However, when we unpack the idea, we find many dimensions, questions and implications that often seem to be left unaddressed. We need to be able to distinguish between different types of scaling processes, we need to understand the kind of scaling processes that apply in particular case, and we need to be aware of the implications of choices we make in terms of approaches and strategies in scaling up and out.

In terms of conceptual understanding, there are many distinctions to be made: scaling up, scaling out, horizontal scaling, vertical scaling, and more. Which one applies? In biological terms, we may say that scaling out is similar to vegetative reproduction (maintaining same attributes), while scaling up is similar to generative reproduction (leading to new attributes). Scaling processes will work out differently for different scale levels. E.g. multiplication of (the use of) a tool is less complex than multiplication of (the application of) a farming system.

Scaling processes are happening all the time, with and without (human) interventions. They are core processes in nature and society. This means that first of all any intervention involves scaling processes from beginning to end, and we need to understand our scaling efforts in relation to other on-going scaling processes (many of which cannot be or will not be affected through the intervention). Neglecting such dynamics may result in failing to see things go to scale. E.g. we may think scaling processes only start in year 3 of our programme, while such processes in reality started from day one of the programme. Or, we may work on technological scaling processes while any desired change would require a scaling of socio-cultural (institutional) processes as well.

Scalability in scaling-up is different from scalability in scaling-out. Scaling up involves a change in qualities/properties of the object of scaling, and will therefore involve more complexity. Since scalability in scaling-out essentially involves replication, we may say that we at least already have a 'prototype'. At the same time, we often need to learn about how something scaled up (finding out about relevant scaling mechanism) to guide efforts of scaling out. E.g. scaling out dairy business hubs will require understanding about the scaling-up processes that led to dairy business hubs.

Regarding scaling (causal) mechanisms (which underpin our ideas on how scaling happens), we make more assumptions than we tend to be aware of. We need to be careful with our assumed understanding about such mechanisms. This relates to the ecological fallacy (what works at one scale will work at another), and the composition fallacy (what is good for one person is good for everyone. Success at one scale level is no guarantee for success at another scale level. This also relates to scale mismatches. A good example of this is the scaling out of a particular agricultural system beyond the carrying capacity of the environment (e.g. available fresh water for irrigation). Lake Aral, the Caspian Sea and some lakes in e.g. Ethiopia are sad evidence of the failure to address such scale mismatching.

In summing up, we can see that scaling up and out is a multi-faceted subject and that we need to be aware of various dimensions of challenges. Such dimensions include dealing with complexity, understanding causality, connecting to system features and dynamics, being clear on theories of change and being aware of conflicting ideas on progress and development.

In this paper, we suggest a number of principles of good practice in engaging with scaling processes. This leads to the definition of not one best approach, but rather to four general approaches that connect to different situations in which scaling initiatives take place. Uncomplicated or simple situations involving little uncertainty and disagreement may be suitable for what we call a 'push' approach: We have something that

we would like to go to scale and we will work hard to make that happen. In more technically complicated situations, a 'pull' approach may be a better fit: we have an aspired future in mind and seek to scale up and out that which we think will help make that future reality. A socially complicated situation may call for a 'plant' approach: we have something we would like to see go to scale, but such scaling can only happen if we connect other factors and work with other (development) actors. And then there are situations which we may call 'wicked problems' in which there is a lot of uncertainty and disagreement. In such situations we want to opt for the 'probe' approach: we have an aspired future in mind, but are unsure about what scaling processes would be involved in moving towards that future.

Scaling strategies will need to connect such broader approaches to on-the-ground realities and there cannot be a standard 'best practice' defined for that. Responsible scaling up and out involves a tailoring of scaling processes to the relevant complex features and dynamics of a situation. General guidelines on good practice in scaling up and out will need to be complemented with the strengthening of appropriate individual and collective competences needed for making such match with context specifics. Such competences relate to e.g. the use of appropriate models, emergent strategies, generative learning, strategic foresight and precautionary decision-making. Documenting cases of such responsible scaling over the coming years will provide inspiration for ways in which to apply theory to practice and for ideas on how to think and act strategically in on-the-ground realities of scaling up and out.

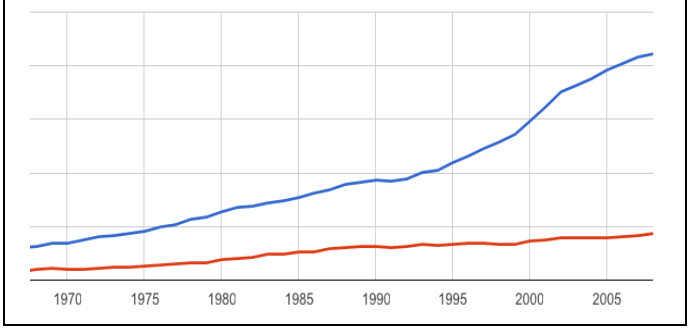
# List of abbreviations and acronyms

| | |
|---|---|
| AR4D | Agricultural Research for Development |
| CAS | Complex Adaptive System |
| CDI | Centre for Development Innovation, Wageningen UR (University & Research centre) |
| CGIAR | Consultative Group on International Agricultural Research |
| MDG | Millennium Development Goal |
| MLP | Multi-Level Perspective (by Geels) |
| IFAD | International Fund for Agricultural Development |
| IFPRI | International Food Policy Research Institute |
| KTI | Knowledge, Technology and Innovation Group, Wageningen University |
| OECD | Organization of Economic Co-Operation and Development |
| R&D | Research and Development |
| ToC | Theory of Change |
| UNDP | United Nations Development Programme |
| Wageningen UR | Wageningen University & Research centre |
| WHO | World Health Organization |

# 1 Introduction

Over the past ten years, there has been a surge in number of reports that describe planning efforts in terms of scaling (up), particularly in the context of international development (figure 1). International organisations such as World Bank, IFAD, WHO and UNDP are among the most prominent proponents of an increased focus on processes of scaling (up) in order to enhance development impact. Some of it may have to do with the approaching year of 2015 when the final scores on Millennium Development Goals will be known and the associated concerns that many goals will not be achieved in parts of the world[3].

**Figure 1: Number of books on scaling up (upper curve) and scaling-up (lower curve) published over the years as percentage of the total number of books published (source: Google n-gram)**




Some of it may have to do with the frustration that there are so many examples of good development results around the globe and that this just doesn't seem to want to 'spill over' to less prosperous parts of the world likewise. Some of it may have to do with the observation that technologically speaking, there is so much good potential, and yet, many parts of the world seem not to be able to reap the benefits of this[4]. Some of it may have to do with the increasing and impending effects of phenomena such as climate change, environmental degradation and global financial-economic slow-down[5]. Since the term 'scaling (up)' has become rather popular in reports and proposals, we will need to beware of it becoming one of those buzzwords that everyone is using, but few are really taking seriously (see Cornwall and Brock, 2005).

Whatever the motivation, the idea of scaling (up) appears to generate a (re)new(ed) sense that 'we can do it': We can eradicate severe poverty, we can achieve food & nutrition security for all, etc. There appears to be the conviction that we can do this, if only we scale (up), where there is a variety of interpretations of what exactly would need to go to scale[6]. Such conviction seems to be inspired by alleged successes achieved in the past (e.g. in terms of widespread application of certain agricultural practices or crops[7], but also in terms of human development[8]) as well as by a general logic that if we do more of that 'which works', it is reasonable to expect good results. Not everyone agrees though that the past few decades are evidence of progress in general, arguing that it depends on the definition of 'progress' (e.g. Collier, 2007; Dichter, 2003; Easterly, 2007). Many argue that 'progress' has not been inclusive neither socially nor in relation to environmental concerns. In this argument, unless we re-scale processes of e.g. technological development and distribution of wealth, we will be paying the price in the future for

[3] See e.g. UNDP (2010) which speaks of "unlocking progress" and "MDG acceleration on the road to 2015".
[4] Former president Bill Clinton is quoted by Olson (1994) to say that 'nearly every problem has been solved by someone somewhere. The frustration is that we can't seem to replicate [those solutions] anywhere else".
[5] Scaling challenges: "If we assume 'business as usual' by 2050 about 40% of the projected global population of 9.4 billion is expected to be facing water stress or scarcity. With increasing climate variability being predicted by global climate models, we are likely also to have more people without adequate water more of the time, even in water-rich regions" Garrido and Ingram (2011).
[6] See e.g. Cash, 2011; Chandy et al., 2012; Cooley and Kohl, 2006; Gradl and Jenkins, 2011; Pachico and Fujisaka, 2004; Steele, Fernando and Weddikkara, 2008. Ezilov (2011) states that "in order to be able to address the problems facing the development world, scaling up must be brought to the forefront of development rhetoric and action" (:24).
[7] See e.g. FAO (2009) on "success stories in agricultural production and food security".
[8] See e.g. Steer et al. (2011), UNDP (2012), Sachs (2006), Starke (2011), Spielman and Pandya-Lorch (2009), Kenny (2013) and UNDP (2013).

environmental and social exploitation on which existing development models are based. As a result of these concerns, alternative development models are suggested, including (inclusive) green economy, eco-innovation, and responsible research and innovation. As we will discuss in this paper, adopted development models have implications for the focus of scaling processes and for what is to be considered 'responsible scaling up and out'.

Many reports, books and articles have been written, which mainly focus on finding improved conditions for scaling (up) (e.g. Gaye & Nelson, 2009; Gillespie, 2004; Hartmann & Linn, 2008; Jonasova & Cooke, 2012; Linn, 2010/2011/2012, Middleton, 2003; WHO, 2009; Mulgan & Kohli, 2010), in particular looking at scaling (up) under adverse circumstances (Binswanger et al., 2003; Chandy & Linn, 2011; Dede, 2006). These publications address questions regarding such as:

- What do we mean by scaling up and scaling out?
- What exactly is going to scale?
- How does scaling up and out actually happen?
- What determines scalability in a particular case?
- What are scaling mechanisms?
- What are effective approaches/strategies in relation to scaling up and out?
- What good do we expect to come out of a scaling (up) process and for whom?
- What capacities are needed to guide processes of scaling (up) appropriately?

The depth of responding to these questions, however, varies significantly. Also, we find inconsistent use of related terminology which makes it more difficult to consolidate lessons learnt.

Because of the variety of conceptual understanding regarding scaling (up), confusion may arise in discussions and debates over what scaling and scaling of innovations in particular actually involves. Taking a deeper look at what scaling involves, leads to the realisation that many well-known concepts in the context of agricultural development were actually all about the very same idea without using the word as such. Diffusion of technology, dissemination of knowledge, mainstreaming of practices, institutionalisation of change: they are all sides of the same cube. Even capacity development can be seen as a process of scaling up knowledge or skills. In other words, the idea of scaling is not new at all and relates to processes that have often been labelled differently. The very fact that so many different concepts are used for the same or similar idea is reason enough for spending some effort on creating conceptual clarity about what scaling up innovations involves. As regards taking stock of documented ideas on and practice of scaling processes in the context of international development, much groundwork has already been done (Anderson, 2012; Clark et al., 2012; ExpandNet, 2011; Fixsen, 2009; Ryan, 2004).

In this paper, we build on ideas from documents which explicitly discuss the topic of scaling (up) while also looking beyond such documents to explore what is at the roots of such ideas on scaling (up) and to explore social perspectives on implications of scaling (up) strategies and practice. The purpose of this fivefold:

1. Contribute to conceptual clarification regarding scaling up and out (chapter 2).
2. Exploration of common interpretations regarding scaling up and out and their limitations (chapter 3).
3. Exploration of relevant challenges in relation to processes related to scaling up and out (chapter 4).
4. Link the above to the multi-level perspective used in Humidtropics to enrich perspectives on strategies in scaling up and out (since it is an important element in Humidtropics' programme framework and also because it is particularly suitable for this purpose) (chapter 5).
5. Suggest ways forward in practicing 'responsible scaling up and out' (chapter 6).

In the suggested ways forward we are not looking for a silver bullet or 'best approach', but rather for expanding views to support sense-making regarding what to take into account when developing/adopting an approach or strategy on scaling up and out to clarify what are the 'points of choice' where different preferences/goals will lead to different approaches scaling up and out. This may inform policy and decision-makers in choosing appropriate approach and strategy in specific settings.

# 2 Conceptual understanding and application

## 2.1 Origins of the concept of scale and scaling

***Etymology***

The word 'scale' stems from the Latin *scala "staircase/ladder"*, and *scandere* "to climb". It is the same root as used in the musical sense where it is a set of musical notes ordered by frequency or pitch. Later, 17th century, the meaning of "proportion of a representation to the actual object" came up. In late 19th century, scale down in terms of "reducing" came up[9]. Merriam-Webster indicates the meaning of a weighing instrument, which indicates along the lines of a particular scale. The transitive meaning (active) relates to making something go to scale: To attack with or take by means of scaling ladders; to climb up or reach by means of ladder; to reach the highest point of (e.g. mountain); to arrange in a graduated series; to measure by or as if by a scale; to pattern, make, regulate, set, or estimate according to some rate or standard (often used with *back, down, or up*), similar to *adjust*. The intransive meaning (passive) relates to an object going to scale in terms of rising or climbing.

Alternative words for the noun 'scale' are: ruler, rule, gauge, measure, balance, gradation, hierarchy, gamut, tier, band, ratio, progression, level, size, range, degree, extent, amount, magnitude, dimension, sequence, scope. Alternative words for the verb 'to scale' are: to climb, to mount, to ascend, to top, to go up, to move up, to climb up, to spread, to escalate. In the context of international development, the verb to scale is often combined with 'up' (most frequently) and 'out'. We will discuss this in more detail in the next section. Though the word can have a range of meanings and connotations, the basic notion may be summarised as (1) a measure (either as a property of an object or a means to establish such property) or size, and (2) a directional process of an object, either directed by an agent or self-directed.

***Scale as a concept***

Scale is a concept that transcends disciplinary boundaries. Scale is a key element in natural and social science. In ecology and geography, scale is usually defined in terms of spatial and temporal dimensions. Scale is generally understood in terms of hierarchy, and different disciplines generally have different criteria for defining and measuring scale. Research results are often dependent on the scale at which the analysis was done (Pachico & Fujisaka, 2004).

Scale may be defined along the lines of different ways of ordering (adapted from Gillespie, 2004):

- Spatial scales: locality, landscape, region, globe;
- Temporal scales: Daily, seasonal, annual, decades, centuries;
- Jurisdictional/geographical scales: Local, municipal, regional, national, international;
- Management scales: tasks, projects, programmes, organisation;
- Economic scales: poor, medium-income, rich;
- Social scales: individual, group, community, country;
- Project scales: input, activity, output, outcome, impact;
- Knowledge scales: from specific to general/universal;
- Organisational scales: micro, meso, macro.

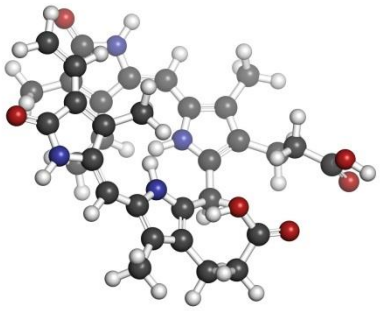
[9] Online etymology dictionary, http://etymonline.com

In the natural sciences, scale relates much more closely to attributes of entities and often (not always) refers to size (e.g. small, medium, large):

- In mathematics, it refers to an ordering in terms of numbers, dimensions, proportions, etc.
- In physics it refers to an ordering in terms of speed of particles, size of particles, etc.
- In astronomy it refers to an ordering in terms of universe, then galaxies, solar system, planet, etc.
- In biology, it refers to an ordering in terms of molecules, cells, organs, organisms, ecosystems, etc.

Scale is often understood in terms of levels. We need to be careful with that. Many of the scale levels we distinguish are not more than social constructs and do not relate to entities. In the idea of 'flat ontologies' no such distinctions are made. It holds that, though there may be a multiplicity of complex relations, there is no such thing as top or bottom, nor a center or margin (see e.g. Schatzki, 2002 and Marston, Jones and Woodward, 2005). It is a matter of perspective and whose perspective counts. The implications of ordering in terms of a kind of hierarchy can be fed by and result in social differences and relate to power and control. In e.g. 'practice theory', most authors tend to approach reality as a flat ontology of connected practices where clusters of practices may be bigger or smaller, but not vary in terms of levels. A slightly different interpretation argues for interpreting flat ontologies not as referring to a world without levels (...), but instead as "a world in which all levels are on the same playing field" (Collinge, 2006). This means we can still use distinctions between levels, but we need to be conscious about what we imply with this and be careful not to treat so-called levels as entities, merely using them to organise our understanding of reality.

**Figure 2: Scaling from a flat ontology perspective – from one component to large constellations instead of distinguishing levels**



## 2.2 Unpacking the concept of scaling

While unpacking the idea and concept of scaling (up), we discover a range of associated concepts and related processes. Many authors have picked up these concepts and sub-concepts and gave them different meanings. We have found different definitions and interpretations of scaling (up) in different disciplines, different sectors and even within same sectors such as within the context of international development. As a result, we always need to verify how different people interpret the overall concept of scaling (up) and related concepts. This would support shared learning as well as shared efforts. As we will see later in this paper, scaling (up) strategies will often involve working in partnership and alliances, which makes the strengthening of shared learning & effort even more important. In the following, we adopt a perspective which we find helpful.

### *Scaling up and out*

'Scaling up' is clearly the most common title used in titles of documents on the concept. We rarely find 'scaling out' in a title. In the following, we will present an interpretation of the two ideas which implies that many of the references to 'scaling up' should actually read 'scaling out'.

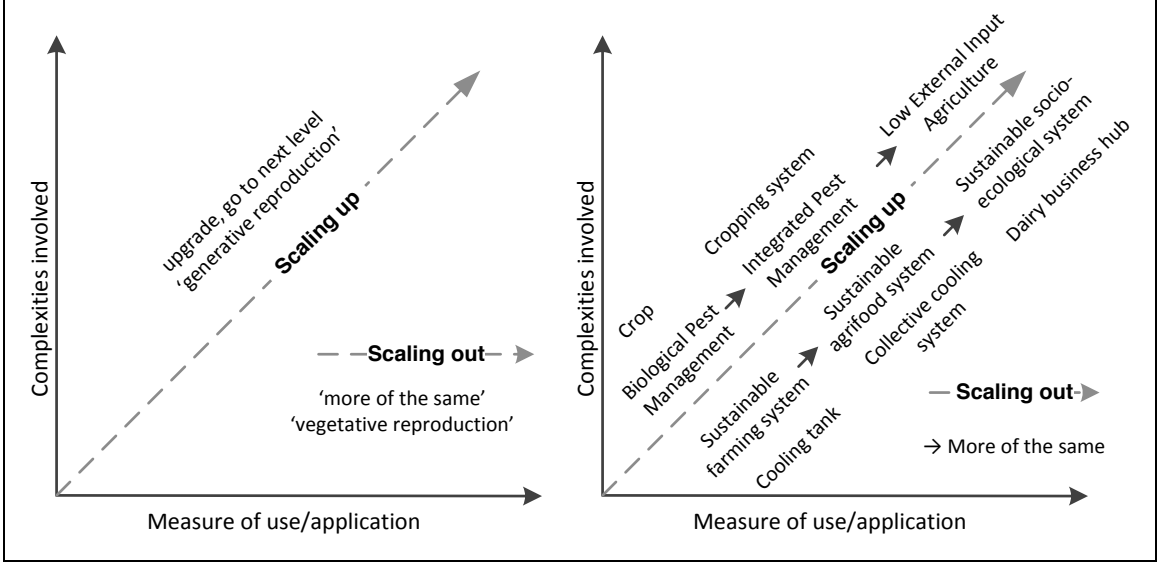
In essence, the scaling out refers to quantity while scaling up refers to quality (properties). Depending on the object of scaling, **scaling out** will mean replication, copy-paste, more of the same, expansion, extension, adoption,

**Box 1: Illustration of scaling up**

The concept of scaling is not just applied in terms of measure, size, spread or extent, but also in terms of shape, form, condition and appearance (pictured by National School of Government, 2011).

dissemination, transfer (of technology), mainstreaming, roll-out, or multiplication. Again, depending on the object of scaling, **scaling up** will mean transition, institutionalisation, transformation, integration, incorporation, evolution, development. It relates directly to the scale 'levels' which we presented in the previous section. Figure 3 illustrates the difference between scaling up and scaling out.

**Figure 3: The difference between scaling up and scaling out, showing this in relation to two different sets of subject areas**




Scaling out processes will be different for the different scale levels. E.g. multiplication of a cell is less complex than multiplication of an organism. In biological terms, we may say that scaling out is similar to vegetative reproduction (maintaining same attributes), while scaling up is similar to generative reproduction (leading to new attributes).

### *Horizontal and vertical scaling*

Another distinction in types of scaling processes is made between horizontal scaling and vertical scaling. This relates to crossing scale levels (vertical scaling), and staying within a particular scale level (horizontal scaling). It is difficult to completely separate the concept of scaling up and scaling out, from horizontal and vertical scaling (see box 3). After all, this is about conceptualisation in order to organise our thinking about different types of scaling processes; it is not about some objective reality. Again, as discussed before, from a flat ontology perspective, it makes no sense distinguishing between scale levels. However, we may consider vertical scaling within such perspective to relate to crossing levels in terms of involving few to many clusters of practices.

**Box 2: Other examples of processes of scaling up**

Scaling up →

| | | |
|---|---|---|
| Product | Service | System |
| Principle | Method | Approach |
| Idea | Argument | Paradigm |
| Tool | Factory | Industry |
| Practice | Process | Project |
| Rule | Regulation | Legal system |
| Behaviour | Routine | Culture |
| Individual | Group | Community |
| Period | Season | Era |
| Cell | Organism | Ecosystem |
| Poor | Medium | Rich |
| Input | Output | Impact |
| Knowledge | Attitude | Behaviour |

| Box 3: Understanding the difference and the connection between scaling up/out and horizontal/vertical scaling | | |
|---|---|---|
| | **Scaling out** | **Scaling up** |
| **Horizontal scaling** | Multiplication at same scale level (e.g. spreading processes, such as wider adoption of technology or of an institutional arrangement within e.g. same district) | Innovation/development (institutional/technological/ etc.) at same scale level (e.g. from local cooling system to local dairy business hub, or from local regulation to local regulatory framework) |
| **Vertical scaling** | Multiplication towards different scale levels (e.g. extension processes, or policy adoption of local practice towards country-wide application) | Innovation/development (institutional/technological/ etc.) towards different scale levels (e.g. from local dairy business hub to national fresh-food system, or from local regulatory framework to national policy) |

Vertical scaling adds a layer of complexity and involves more uncertainty in terms of outcomes of scaling processes than horizontal scaling does.

### *Transitive (active) and intransitive (emergent) scaling*

In nature, scaling is a core phenomenon which happens without human interference. It is manifested in e.g. biological processes such as growth, multiplication, and mutation, and in physics processes such as gravity (when an object falls, its speed will scale according to a certain formula – a scaling law), etc. But we can also distinguish 'natural' scaling processes in social life such as in group formation, traffic, etc. We will later return to the importance of making this distinction, when we argue that scaling up and out happens (intransitive) all the time with and without human interference, and that conscious efforts to scale up and out (transitive) need to be understood in such context. An equivalent of intransitive scaling is what some have called 'see-it-happen scaling', while the equivalent of transitive scaling would be 'make-it-happen' scaling. Strategies related to scaling up and out are not just about dealing with planned/controlled scaling processes, but also about connecting to emergent (not planned/controlled) scaling processes.

### *Scalability*

Intrinsic scalability is about whether the object of scaling can scale at all, and/or whether it still makes sense when it scales. A drill can be huge and still fulfil its essential function. Extrinsic scalability is about whether it is feasible to scale a particular object (can we make it happen?). Making a drill beyond a certain size is something we just cannot do. Therefore, an object can be intrinsically scalable (it would still make sense), but we just can't make it happen due to particular constraints in e.g. our capabilities. Scalability also relates to proportionality. At a certain scale, proportions of an organism may be just right, but if we proportionately scale all parts of the organism, we get into trouble. This is why people rarely become taller than 2.2 metres. There would need to be a disproportionate scaling of e.g. the skeletal frame to sustain the rest of the body in order to grow bigger and still thrive. An example in terms of extrinsic scaling would be that a small car may be very useful in a city, but making it significantly bigger will not make it more useful.

**Box 4: Variables in relation to scalability**

Cooley and Kohl (2006) identified the following variables in relation to scalability (mainly in terms of scaling out) of innovations. They must be:

1. **Credible**, based on sound evidence or espoused by respected persons or institutions;
2. **Observable**, to ensure that potential users can see the result in practice;
3. **Relevant**, for addressing persistent or sharply felt problems;
4. Having a **relative advantage** over existing practices;
5. **Easy to transfer and adopt**;
6. **Compatible** with existing users' established values, norms and facilities;
7. **Able to be tested or tried** without committing to potential user the complete adoption when results have not yet been seen.

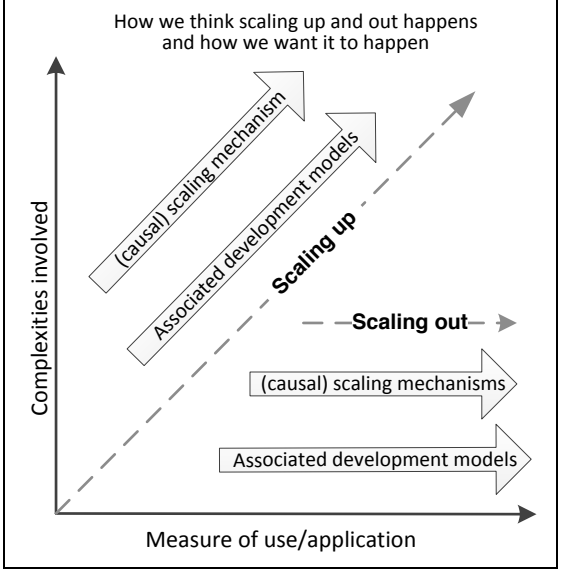
This still leaves open the question of when we consider an innovation to be credible, relevant or compatible.

Scalability in scaling up is different from scalability in scaling out. Scaling up involves a change in qualities/properties and will therefore involve more complexity. Since scalability in scaling out essentially involves replication, we may say that we at least already have the prototype.

In scaling up, there is no such prototype. Most challenges regarding scalability will relate to scaling up. Ex-ante it is difficult to say whether something can be scaled up. Can a new crop variety become part of a farming system? We can only be sure when it happened. But we often also need to learn about how something scales up (finding out about relevant scaling mechanism) to guide scaling out. E.g. scaling out dairy business hubs will require understanding about the scaling up processes towards dairy business hubs. Such understanding may lead us to say that the dairy business hub (using this as example only) is not scalable to a particular context. This underscores the interconnectedness of scaling up and scaling out processes.

Often when a complex system is not scalable, it is because of a conflict between various subsystems. In the case of animals, the weight scales one way, and the strength of the bones scales another way. Either weight or strength is scalable separately, but when we put them together we get a conflict. (...) Skeletal strength is not the only issue; the metabolism of any creature will generate heat in proportion to volume, while the ability to dissipate heat into the environment scales like surface area. This causes problems for large creatures (too much heat build-up) and for small creatures (too much heat loss).[10]The same can be said to apply to social and socio-technical systems. Scalability as a property of e.g. systems is therefore difficult to define in general.

**Figure 4: Ideas on how scaling up and how happens and how we want it to happen, inform theories of change and associated development models**




In AR4D, we connect natural scaling processes to social scaling processes. A particular agricultural practice may be deemed scalable because of its natural properties (e.g. removing virus-infected leaves from sweet potatoe plants is something that could be done in many places), but because of cultural preferences, it may still not go to scale. There are also very different ways of using the term 'scalability'. E.g. IFAD defines projects as "scalable" if they can be handed off to partners for potential application at a larger scale" (IFAD, 2011). Consequently, Linn, J. F., (ed.) (2012), in writing about scaling and sustainability, states that unsustainable project will not be scalable. This will usually be more related to extrinsic scalability than intrinsic scalability.

### *Causal mechanisms and development models*

Causal mechanisms in relation to scaling processes are about what makes an object scale up and/or scale out. Development models and theories of change relate closely to scaling mechanisms as they are about our interpretations of how things go to scale. The idea of 'pathways to scale' is a good example of this. Scaling laws are about power laws that underpin scaling mechanisms in nature.

IPRI's report on women in agriculture (IFPRI, 2000) is in fact a presentation of interconnected scaling mechanisms. They sum up the benefits of focusing on women as the key to boosting agricultural productivity and food security, which we have translated towards the language of scaling:

[10] Ibid.

1. Agricultural productivity scales dramatically when women's access to inputs is the same as men's.
2. Scaling women's human capital is one of the most effective ways to scale down poverty.
3. Scaling women's assets makes investments in education and girls' health go to scale.
4. Scaling women's education and status within the household contribute more than 50 percent to the scaling down of child malnutrition.
5. Women's access to food and nutrients scales up less than proportionately with the rate of scaling up of access of the household as a whole.

These examples relate to finding mechanisms along the lines of 'if this goes to scale, then as a result something else will go to scale'. The same can be phrased as a causal relationship.

Another example would be that the scaling of one particular crop (induced by human agents) may 'invite' a scaling of a particular pest that is attracted to that particular group (induced by e.g. rodents or insects). We would argue that there is a need to take such interconnected causal mechanisms which involve scaling more into account. Finding interconnected causal/scaling mechanisms needs to be an important input into our planning processes: 'if we do more of this, we expect less of that', or 'if we increase this, that will also increase'. This means our understanding about scaling mechanisms is a very important ingredients of our theories of change and related development models (see figure 4). How we approach scaling up and out will therefore be closely related to how we think change happens (mechanisms) as well as to how we would like to see change happen (preferences and perspectives). If our understanding is wrong or misguided...

We need to be careful with our understanding about scaling mechanisms: One tv set in a village may create stronger group cohesion. Scaling out tv set ownership significantly (e.g. up to 80% of the households), will probably lead to a loss of group cohesion.

### *On scaling laws*

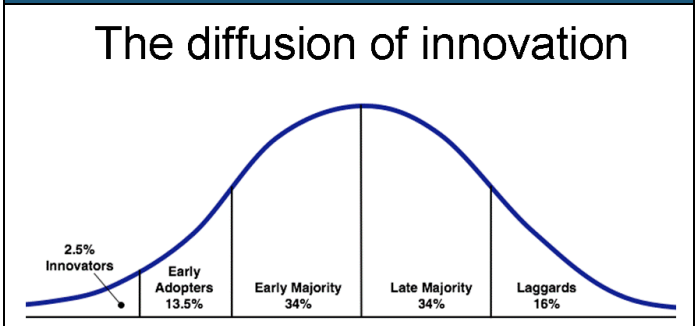
Scaling is a fundamental process in nature. Scaling mechanisms e.g. make that things grow proportionately. We can be thankful that for most of us, our arms and legs grow to the same length. These mechanisms also put a stop to growth at a certain point, for which reason there are few people taller than 2.2 meters. In physics and biology, universal laws have been found governing how things scale up, reflecting underlying generic principles and mathematical patterns. These surprisingly simple laws apply to almost every characteristic of living organisms, from individual cells all the way up to complex biological ecosystems. The universal character of these "laws" lead West (1999) to think that it is telling us something important about the way life is organized and the constraints under which it has evolved. Later in his career, he therefore started exploring to what extent such scaling laws may also apply to process like city development[11] (also see West & Brown, 2004). "Most, if not all, complex systems have a propensity to exhibit scaling properties (...). The signature of a scaling property is a *power law correlation* between variables of the system or *power law probability distribution* of a property of the system" (Katz, 2006b:4). Others have explored it in the context of social systems (e.g. Pumain, 2003), human interaction (Rybski et al., 2009), and innovation systems (Katz, 2006b).

In this paper, we cannot explore this subject matter in depth, but it does not seem too far-fletched to assume that, with the inspiration of natural scaling laws, we may be able to have a better grasp for what is reasonable to expect in AR4D scaling up processes across ranges of scales as discussed in section 2.2. This appears to be quite relevant in relation to such ideas as agricultural system intensification as well, where a range of scaling laws apply as regards biological/ecological processes, but possible just as much in relation to scaling processes such as diffusion of innovation.

[11] Interview with Geoffrey West in Alliance Magazine, Volume 15, No.2 June 2010.

Rogers' famous theory (Rogers, 2003) is inspiring many even today, including at CGIAR. He has updated his theory along the lines of complex adaptive systems (Rogers, 2005). Such theory development is helpful in developing policies and strategies along the lines of scaling up processes. However, though universal scaling laws may exist in nature, as West asserts, it is doubtful whether any social scaling law would apply universally. Furthermore, the theory of diffusion of innovation may in fact relate to a socially constructed law, because of the selection of the specific innovation and the construction of a desired adoption in relation to which someone is labelled 'innovator or 'laggard'.

**Figure 5: Diffusion of innovation theory as assumed scaling mechanism**




## 2.3 Approaches and interpretations

There is a variety of ways in which a range of authors and development organisations have contributed to discussions on the concept and practice of scaling up and out. However, as indicated before, 'scaling up' is often used as a kind of generic term that covers the whole of scaling processes. This is not always helpful in understanding the kind of scaling processes that apply in a particular situation.

Much work has been done in relation to the application of the concept in the context of health services, particularly by the World Health Organisation (WHO) and Expandnet[12]. This has led them to design a nine-step process for scaling up, which is based a conceptual model that points to elements of scaling up (using it in its generic meaning) and strategic choices to be made (WHO, 2010). Though different from agricultural development, it nevertheless holds valuable insights for application in this context as well.

An exploration of some definitions of scaling provides further ideas on how it is conceptualised in the context of international development. Usually, the term used is 'scaling up'.

- Identifying the most effective ways to channel additional resources in order to maximise impact on the MDGs (DFID, 2013).
- To efficiently increase the socioeconomic impact from a small to a large scale of coverage. (World Bank, 2003). The World Bank also argues that scaling up involves both "means" (for example, replication, spread, or adaptation of techniques, ideas, approaches, and concepts) as well as "ends" (that is, increased scale of impact) (Anderson, 2012).
- The expansion, replication, adaption and sustaining of successful policies and programs in space and over time to reach a greater number of people" (Hartmann and Linn, 2008; Chandy and Linn, 2011).
- "Scaling-up" is the process of reaching larger numbers of a target audience in a broader geographic area by institutionalizing effective programmes (Expandnet, 2011).

Cooley and Kohl do not define, but rather describe what is involved in scaling up: "several distinct strategies including: the dissemination of a new technique, prototype product, or process innovation;

[12] Expandnet not only shares some of their own work on this topic, but also provides links to a wide range of relevant literature at http://www.expandnet.net/biblio.htm.

"growing" an organization to a new level; and translating a small-scale initiative into a government policy." (Cooley and Kohl, 2006).

WHO (2008) states that "in its current usage, scaling up is often intended to convey haste, urgency and the need for a "special effort" – this is qualitatively different from "doing a bit more, but in the style of business as usual". It appears that for many international development organizations, scaling up essentially refers to an intensification of effort, and does not so much relate to a deeper meaning such as how we explained types of scaling in the previous section.

There are some useful perspectives from the context of social entrepreneurship which can enrich interpretations that are common in international development circles. Kalafatas (n.d.) developed the following overview of types of scaling processes, where his focus is not on scaling (up) products and/or services, but rather a certain desired impact (development outcomes):

Direct service; scaling in terms of:
- Increase quality or quantity of impact
- Diversify communities served
- Diversity services offered
- Expand geographically
- Organizational branching
- Expand organizational delivery capacity

Direct-indirect; scaling in terms of:
- Promoting certain models
- Technical assistance
- Knowledge dissemination
- Packaging/licensing
- Partnerships/alliances

Indirect influence; scaling in terms of:
- Influence public policy (environment)
- Establish social movement
- Change/create markets
- Generating knowledge
- Influence public awareness, norms, behaviour
- Direct advocacy and lobby
- Network development

### *Object of scaling*

Almost anything can go to scale, depending on the specific meaning attached to the concept of scaling. We are not going to list all entities in nature and society that can go to scale, because the list would be endless. In the following exploration, we zoom in on the context of international development. The following overview gives a bit of a feel for the sheer variety of what has been taken as the object to scale (up):

- Scaling up microenterprise services (Edgcomb, 2002);
- Scaling up community-driven development (Gillespie, 2004);
- Scaling up forest-friendly finance (Oakes et al., 2012);
- Scaling inclusive agri-food markets (Woodhill et al., 2012) or inclusion as such (Jenkins et al., 2010);
- Scaling up agroecology (Ecumenical Advocacy Alliance, 2012);
- Scaling up the Millennium Development Goals (WHO, 2010);
- Scaling up innovations (Smits, Moriarty and Sijbesma, 2007);
- Scaling-up natural resource management (Carter and Currie-Alder, 2006);
- Scaling up global food security and sustainable agriculture (Power, Gardaz and Dey, 2012);
- Scaling-up of training and education for health workers[13];
- Scaling up innovative approaches (Moriarty et al., 2005);
- Scaling up health services (Paina and Peters, 2011);
- Scaling up success (Dede et al., 2006).

[13] http://www.human-resources-health.com/series/1478-4491-Scl

We would argue that most of the above examples are more about scaling out than scaling up, or that it involves at least a combination of scaling out and up. Moreover, some examples relate more closely to that intensification of effort rather than to interpretation of scaling processes.

### *Dominant interpretations*

The overriding interpretation of scaling up appears to be along the lines of linear development processes, which is sometimes framed as 'pathways to scale'. It seems to point to a dominant focus on controlled scaling (out) and a neglect of the fact that scaling is a fact of life with which we constantly need to interact and not just a stage in a development process. Figure 6 (from Linn et al. (2011), is a visual presentation of this kind of thinking. We find this as main approach at the World Bank (Jonasova and Cooke, 2012), IFAD (Hartmann et al., 2013), WHO (2010) and several other international organisations.

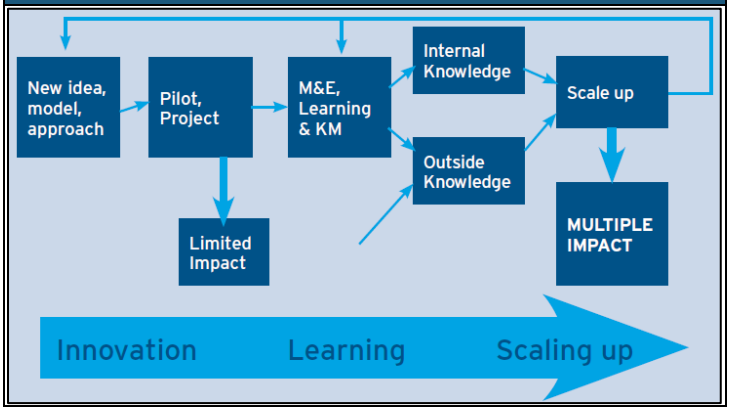
The essential idea behind this approach is expressed by Koh, Karamchandani, and Robert Katz (2012) in their study titled "From blueprint to scale" in which they propose an approach of finding blueprints, validate those, prepare for scaling and then scale up. This perspectives drives a strategy of finding ways of moving from pilot to scale, which turns out to be very challenging in many situations. Moriarty et al. (2005) studied associated constraints and presented the following list:

- Particularity of context in which innovation was identified: in terms of e.g. institutional environment, and/or in terms of support to see innovation take off.
- Lack of consolidation and institutionalisation.
- Lack of ownership at appropriate levels.
- Lack of capacity for replication and scaling-up.

Creech (2008) therefore concludes that "the scaling-up process requires a tremendous amount of negotiation, diplomacy, patience, flexibility, time and resources to be successful". This seems to point to an attempt to steer and control scaling processes. In many cases scaling processes cannot be controlled as much as we may want and therefore reported constraints and the difficulty of negotiating those may point to the inappropriateness of the approach. It may sometimes point to an instrumentalist view on how change happens and may work well in relation to uncomplicated situations, but much of the AR4D approach does not relate to that category of work.

Linn, J. F., (ed.) (2012) acknowledges variety in types of scaling processes. Nevertheless he believes that 'scaling up pathways' helps to learn more strategically because it would clarify how we think change happens. He emphasises the importance of concerted efforts to prevent that everyone would be scaling up their own pilot projects. Scaling is then interpreted as ensuring the quality of a development impact, reaching out to those 'left behind' and ensuring the sustainability and adaptability of results. It is not about just replicating successes to cover larger groups or populations and he maintains that "scaling up depends on successfully designed and implemented pilots, as well as political and fiscal space that is available for wider institutionalization of results (:7). UNDP (2013) and Chandy et al. (2013) build on this kind of approach.

**Figure 6: The pathways to scale idea (from Linn et al., 2011)**



Tentatively, we may conclude that the overarching drivers for scaling up approaches are along the lines of what we would call a push-approach in (development) practice ( a 'make-it-happen' approach to innovation/ development). It focuses on problem-solving: find solutions to problems and scale those out (where many will phrase this as scaling up). Though the mainstream thinking on the concept and practice of scaling (up) may be characterised as in the above, there have been shifts of focus and approach over time and it may change more over the next few years. Clark et al. (2012) report a growing emphasis on funding 'what works' (also see Bold et al, 2013). Though it is not the same, 'what works' tends to be associated with 'impact' according to the following logic: if we scale up 'what works', we will see more impact (along the lines of set goals). There are complications in this line of argument which we will explore in chapter 4.

Wilson, Wilson and Harvey (2011) report on Oxfam's new thinking on 'scale', which provides some useful clues for finding ways forward in developing policy and strategy in relation to scaling aspirations:

**Box 5: Emerging new thinking on scale and scaling (Wilson, Wilson and Harvey, 2011)**

| 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 directly, 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 Oxfam's direct reach | More catalysing, more 'trusting emergence', more capitalising on existing innovation capacity of e.g. social innovators |
| Scale is reached by increasing Oxfam's programme funding | Scale is 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 | Systematization 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 dynamic |

**Adapted from Wilson, Wilson and Harvey (2011)**

Other broader interpretations of scaling can be found in the context of social innovation. Tayabali (in his 'definitive guide to scaling social enterprise (2012) points to the role of scaling processes that capitalize on partnerships, alliances and networks through mass participation, through co-operation, through open source, through open design, and through collaborative networks. In chapter 5 we will explore implications of adopting such approach that is focusing less on seeking control and more on seeking connectivity.

### *Reflections*

Scaling up and out is less of a straightforward concept than we might expect it to be, given the ease with which so many use it in pleas and proposals. When we unpack the concept, we find it loaded with associated processes and dimensions and linked to a range of possible approaches and other concepts (which we will further explore in the next chapter).

Scaling happens everywhere, all the time and along different types of scales. It cannot be understood as a mere step in a development process. We need to be aware of the fact that scaling is preceded by other forms of scaling, is going hand in hand by other forms of scaling and will trigger and be affected other

forms of scaling. We need more overview of what to take into account and what kind of scaling processes may be at play in particular situations or practices and how they might interact. E.g. when scaling up one aspect, other aspects may automatically scale down or scale up as well.

There appears to be a tendency towards linear thinking and an instrumentalist take on the concept and practice of scaling (up) in the context of international development. In many of these cases, where the term 'scaling up' is used, the term 'scaling out' would have been more appropriate. We quite regularly come across the idea of scaling up "what works" or "best practices". The idea of 'roll-out' is very much related to this kind of thinking. In the context of AR4D this seems not to provide the full picture because of two important fallacy concepts concerning scale: the ecological fallacy (what works at one scale will work at another), and the composition fallacy (what is good for one person is good for everyone). Such automatic inferences may misguide a process of scaling (Menter et al., 2004). In addition to these fallacies, there is the earlier reported fact that if one thing scales, other things will scale as well, where often we are not aware of the intricate connections between such scaling processes (more on this in chapter 4).

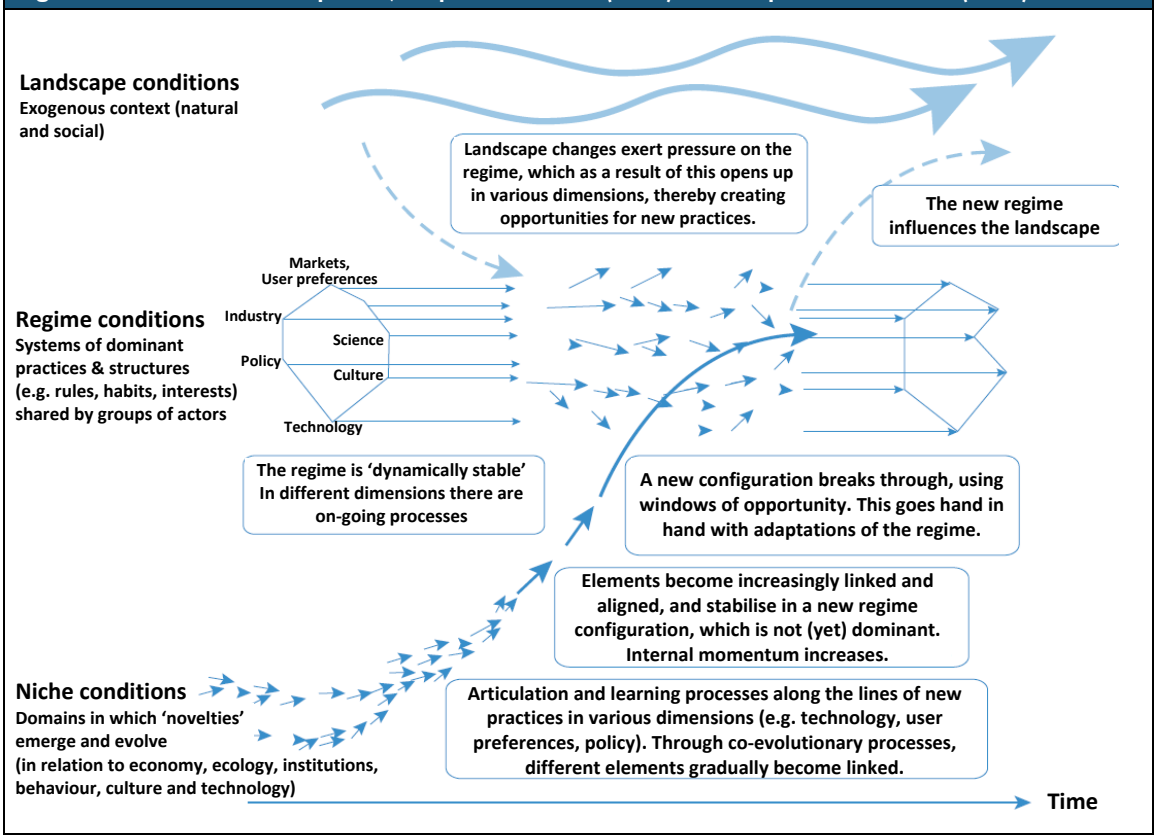
# 3 Scaling from a multi-level perspective

## 3.1 The Multi-Level Perspective

The Multi-Level Perspective (MLP) has been adopted by CGIAR Humidtropics to provide strategic guidance on systemic change processes and the positioning of research services in this context. We find it to connect very well to the understanding and guiding of scaling processes.

Frank Geels (e.g. 2001) developed the Multi-Level Perspective on the basis of historical research on technological transition processes. If we phrase it along the lines of scaling, he wanted to understand what makes 'innovations' go to scale and what prevents them from going to scale. For this purpose he constructed a model that illustrates processes which he describes on the basis of empirical (historical) data of technological innovation. The multi-level idea relates to the level of niche, the level of regime and the level of landscape. The 'landscape' concept is a bit misleading as it has no connection to any geographical level or scale. The landscape is the least dynamic level and relates to worldviews, paradigms, culture and politics. The regime level relates to the constellation or system of interacting institutional processes that have come to a certain stability, which can, however, be perturbed, after which an influx of novelties that (co)evolve at the niche-level may be accommodated, leading to a reconfiguration of the regime, which may in turn influence the landscape level.

**Figure 7: The Multi-Level Perspective, adapted from Geels (2002) and Kamp & van den Bosch (2006).**



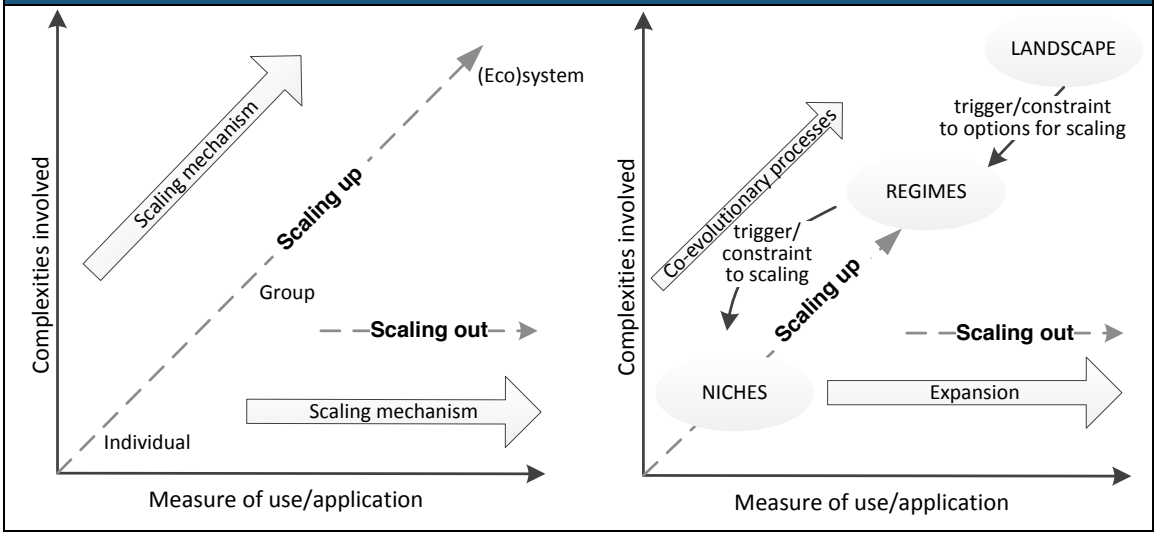

The essential idea is that novel/deviant practices are a bit like young birds, the ones who are raised in a nest before they fly out. First there are the eggs which are hatched out and after they hatched, the young birds are fed by the parents for some time before they leave the nest. The niche is like the nest. Like

some eggs never hatch and some birds never leave the nest and some young birds don't survive the first couple of days after leaving the nest, so deviant/novel practice may not get beyond a certain stage of development (see figure 7) or may never become incorporated in mainstream practice (regime). Whether or not a deviant/novel practice will make it to becoming part of mainstream practice, depends on niche conditions, regime conditions and landscape conditions. Landscape conditions may 'force' prevailing practice (regimes) to open up and reconfigure as it allows for bringing in deviant/novel practices. In turn, the reconfigured regime may influence the landscape conditions. The model shows how various levels contribute to change and stability where niches are the locations of variety, where seeds of change are generated, and regimes provide stability and retention. Strategic niche management involves the guidance of niche experiments to create optimal conditions for deviant/novel practice becoming incorporated in reconfigured regimes.

## 3.2 Scaling up and out in a multi-level perspective

We may say that the MLP is very much about scaling up, where scaling out plays a role in scaling-up processes. When we take the essential build-up of the MLP model and put it next to the model that explains scaling up and out, the connection becomes evident (see figure 8). The two pictures are not referring to exactly the same processes. We do not equate the two. However, the scaling up from one scale level to a next does closely relate to the idea of 'novel practice' scaling up to become part of a regime.

**Figure 8: The multi-level perspective in view of processes of scaling up and out**



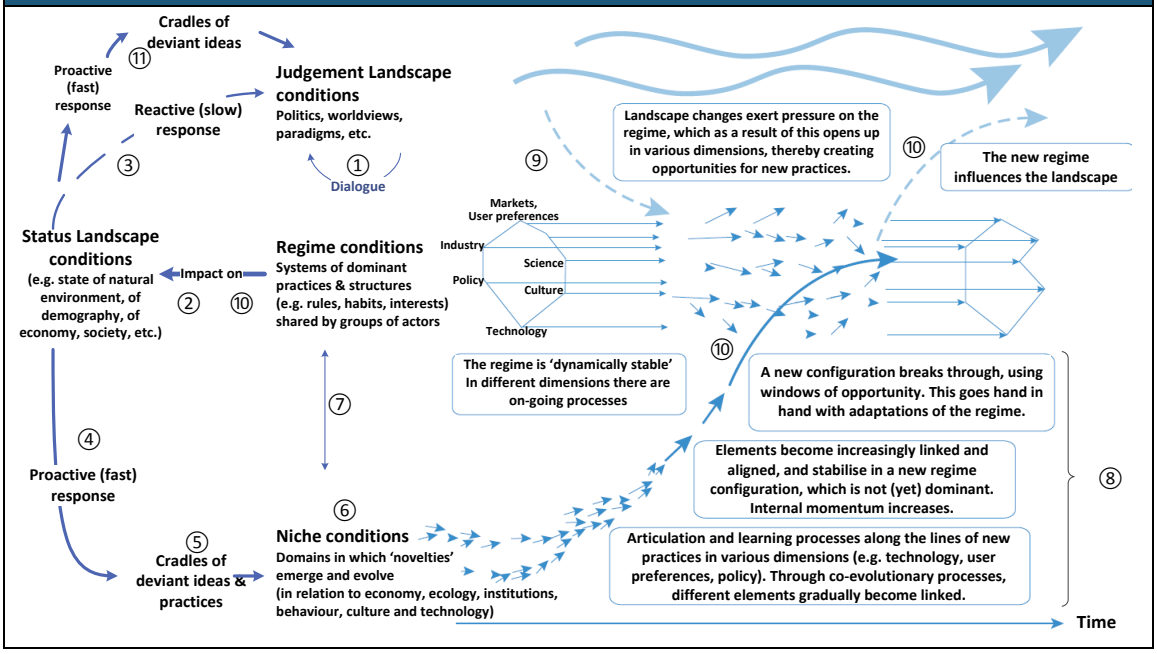

In fact, MLP helps in understanding how scaling happens. MLP theory also contains examples about the interaction between processes of scaling out and scaling up (e.g. where a novel practice is first scaled out within a particular niche, which then enhances opportunities for it to scale up to become part of a particular regime). Below the niche level we can also distinguish cradles (breeding places) of novel/deviant practices, where nursery may refer to individuals, small groups, laboratories, or micro-niches. There also is a need to expand beyond the technology-focus of the model by considering niche experiments in relation to social aspects such as novel/deviant institutions (Hegger, van Vliet and van Vliet, 2007)

There is a lot to unpack in the model in terms of what happens within niches, regimes and landscapes, and what happens in the interaction. Figure 9 explores what happens when we make a distinction within the landscape level in terms of:

- The judgement landscape (our term for how 'landscape' is used in the original MLP model)
- The status landscape: the state of affairs in the natural and social world which is dynamic

The figure is an experiment in tweaking MLP so as to get more out of it.

**Figure 9: Tweaking MLP by including e.g. natural environment dimensions to enrich perspectives on innovation processes**




By making such distinction at landscape level, we can see deviant practice as proactive response to changing regime conditions. We may also distinguish between novel/deviant practice and novel/deviant ideas (in the more philosophical sense of the word). The numbers in the figure correspond with different types of capabilities/strategies associated with creating room for deviant/novel practices to go to scale:

1. Working through dialogue regarding judgment landscapes (e.g. through debates).
2. Identifying implications of current regimes for natural landscape conditions (e.g. through research).
3. Accelerate reaction to natural landscape conditions and its dynamics (e.g. through awareness raising, lobby & advocacy).
4. Enhance strategic foresight and proactive development of new practices in response to emerging dynamics on natural landscape conditions (e.g. through strengthening innovation capacity).
5. Enhance ability to recognize on-going, promising deviant practices (e.g. through exploratory surveys).
6. Enhance niche conditions (e.g. by improving enabling context for innovation and experimenting).
7. Proactive positioning of new practices to enhance opportunity of uptake (e.g. through forward-thinking R&D).
8. Enhancing innovation processes resulting in regime adaptation (e.g. through value chain approach, partnerships, support to capacity development).
9. Strengthening the ability to (fore)see opportunities arising from landscape changes (e.g. through foresight analysis).
10. Strengthening the ability to understand link between intervention and changes at regime and landscape level (e.g. through monitoring and evaluation).
11. Capitalising on/connecting to emerging ideas and schools of thought. E.g. if we want to see particular qualities go to scale which are not 'business-as-usual', such as inclusiveness in the

context of inclusive business models (e.g. Foster and Heeks, 2013, Gradle and Jenkins, 2011), or in a wider context such as related to gender (Perch and Labbate, 2011), this entry point (together with number one) may have to be addressed before anything can change.

The picture that emerges shows that processes of scaling involves working on several fronts. It also points to the importance of considering what would be the most strategic/ appropriate intervention point where developing new practices/technologies, may not necessarily be the best strategy. Schot and Geels (2008) found that "many demonstration projects were organised in an overly contained way. Networks tended to be narrow and projects tended to focus on first-order learning[14]. Consequently, many demonstration projects followed too much of a technology push approach. (...) Failed niche experiments could often be related to either minimal involvement of outsiders in the experiments and a lack of second order learning, or to minimal involvement of regime actors which resulted in lack of resources and institutional embedding (:541). They discuss policy dilemmas in relation to the kind of choices to make in dealing with the various conditions and associated dynamics (adapted from Schot and Geels, 2008):

- Are we going to try to be flexible and see what works out, or will we be persistent in 'pushing' a particular deviant/novel practice?
- Will we try to deal with and learn about all conditions or will we focus on some of those?
- Are we going to try follow a bricolage (slow moving) strategy or a breakthrough strategy?
- Will we work with mainstream actors or rather with outsiders?
- Will we create prolonged protection to nurture novel practice, or will we expose it early on to test viability?
- Will we wait for cracks in the regime, or will we try to force cracks into the regime?
- Do we aim for gradual reform or radical revolution?

Finding answers as to what would be an appropriate approach to these questions will also need to involve improving our understanding about e.g. scaling laws, causality, change and system dynamics. Some of the understanding, however, can only be found if we try (experiment). The ultimate potential of new technologies is rarely foreseen at the start (Geels, 2001).

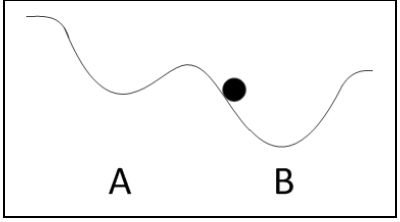
## 3.3 Complementing the multi-level perspective

There are a number of subject areas which may help expand views on dealing with scaling from a multi-level perspective.

### *Equilibrium thinking*

The idea of equilibrium relates to the state of a system (regime) in terms of balance between opposing forces or influences. The state of equilibrium relates to the stability of such balance. The kind of stability with which we need to deal, has implications for scaling (up) processes. Stable systems/ regimes (positive static), will resist change more than unstable (negative static) systems. This may be a good thing if the stability relates to system/regime features that we like, but will be interpreted as problematic if it relates to features we don't like. Therefore, even though systems can be seen as dynamic and changing continuously they also tend towards a relatively stable state which is labelled 'an attractor'. Attractors can be seen as "a state or a reliable pattern of changes (e.g. periodic oscillations toward which

**Figure 10: A dynamical system with two attractors (A + B) (Source: Coleman et al., 2007)**




[14] Also referred to as single-loop learning. This is about learning within the context of a given problem definition without attempting to learn about underlying cause-effect relationships nor to learn about wider implications of suggested solutions.

a dynamical system evolves over time and to which the system returns after it has changed" (Coleman et al, 2007: 5). There are many examples of this in the context of socio-technical systems, such as dominance of fossil fuel based energy systems despite the existence of alternative sources of energy (Leeuwis and Aarts, 2010). This idea of 'attractor' is visualised by figure 10. "Although the precise the state of a system (represented by the black ball) fluctuates continuously, it tends to gravitate towards attractor B (e.g. 'dominance of fossil fuels'). If sufficiently perturbed to overcome the hurdles in the landscape of attractors (i.e. has enough 'energy' to reach the top of the 'mountain'), the state of the system can in principle shift suddenly towards attractor A (e.g. 'breakthrough of renewable energy'). However, it is very unlikely that a single intervention aimed at a specific target will yield such a result. Due to the web of relationships involved in a complex system, such an intervention may simultaneously have 'positive' and 'negative' influences on achieving certain ends (...). From a sociological perspective, attractor landscapes, social structures, institutions and regimes have much in common (Leeuwis and Aarts, 2010).

There are various lessons to be learnt from this for understanding implications of scaling (up) processes:

- Scaling (up) something novel in stable systems (regimes) will be hard to do;
- Scaling (up) something novel in unstable systems (regimes) may trigger more change than anticipated;
- Scaling (up) something novel may take system/regime properties 'over the edge', with the consequence of it plunging into an undesired state without a way to reverse the process (look before you leap).

Understanding 'attraction-rejection' characteristics of systems (which can also be conceptualised as regimes, social structures, attractor landscapes) helps in understanding questions regarding scalability and conditions for scaling (up), both in terms of feasibility and appropriateness.

### *Innovation thinking*

Innovation has for a long time been closely associated with technology and the introduction of technology. This probably has to do with its early history of use in the context of industry. It was part of a linear concept of modernization through technological change: technological products and services were developed by researchers and other experts and introduced to practices deemed in need of such technology. This is where the idea of 'transfer of technology' was born and it became a widespread model for agricultural development as well.

Over the past decade or two, there has been a shift in perspectives on innovation from transfer of technology (from 1960s) via agricultural knowledge and information systems (AKIS) to agriculture innovation systems (from 2000s). In the language of scaling up, there has been an associated shift from scaling of productivity through the scaling up of livelihood conditions, to scaling of e.g. value chains and of institutional change. In line with this, the first era was characterised by a supply-push from research (scaling out technology packages), the second era by demand-pull from farmers (scaling joint production of knowledge and technologies), and since the 2000s there is more attention for responding to changing contexts and complex patterns of interaction (scaling shared learning and change as well as social networks of innovators) (Klerkx et al., 2012; Leeuwis and Aarts, 2010, Leeuwis, 2010) However, talking about eras is perhaps misleading. Each of the three modes of approaching innovation can be found in action around the globe to this day. Technology-transfer or 'technology-push' is still prevalent while lip service is paid to the idea of innovation systems thinking (Röling, 2009).

Though there is a shift away from thinking about innovation as the introduction of technology, we can see that some of the newer thinking along the lines of innovation systems actually builds on some ideas on technology development. Already in 1979, Dobrov noted that technology development happens in different

intensities and there are different levels of reach (extent). He therefore described technology development along the lines of three scales:

- Hardware: Technical means (machines, materials, energy, technical components, apparatus, etc.)
- Orgware: Institutional arrangements (regulations, management, law and rules, organisational structures, training and education, etc.)
- Software: Methods of operating (skills, attitudes, concepts, programming, instructions, etc.).

In this picture, however, important elements of the less flexible context in which this happens are missing. Building on the distinction between landscapes we made earlier, we would suggest to add two elements of the context which provide the space in which hardware, orgware and software configurations evolve:

- The status space, which is about the state of affairs of rather unmoveable natural and social conditions, such as laws of nature, the natural environment, (incl. climate), demography, etc.
- The judgement space, which include paradigms, worldviews, personality types, personal styles and 'rationalities' that determine the room for manoeuvre in (re)configuring hardware, orgware and software.

**Figure 11: The selection context for the (re)configuration of hardware, orgware and software**

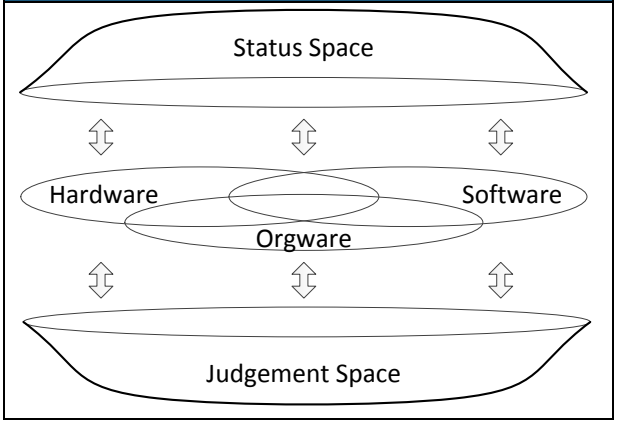
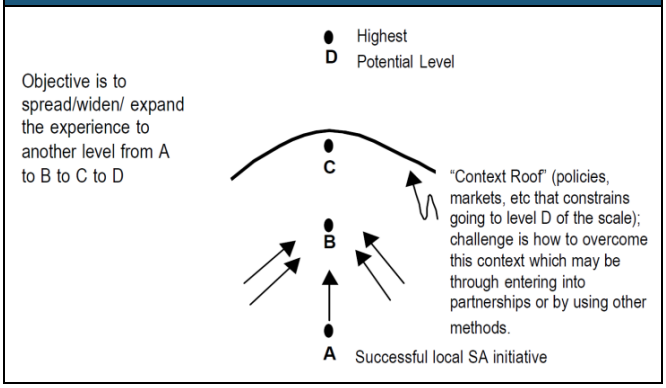



Figure 11 illustrates this where the idea would be that the status context and judgement context are like two caps that can be screwed to each other, thereby creating the space/ context in which configuration and reconfiguration of hardware, software, and orgware (regime formation) takes place. This, in essence, sketches the content of and the context in which innovation systems evolve.

Increasingly, by social and natural scientists alike, institutional dimensions of innovation processes are recognised as the frontier of innovation processes and of the quest for scaling (up) innovations. Röling (2009) argues in relation to the future of agriculture in Africa that three prevalent bodies of expertise and practice for increasing the productivity of African agricultural resources have been found wanting: 'technology supply push'; the agricultural treadmill; and land grab. "These dominant perspectives do not recognise institutional change as a necessary condition for agricultural development. The current emphasis on productivity per ha at the farm level ignores the crucial institutional context at the higher-than-farm level. Yet the history of agricultural development in industrial countries points to institutional development as the key entry point for making family farming more productive." The Multi-Level Perspectives provides new insights regarding such ceilings which are associated with what are called 'regimes'. However, it does require more understanding about novel institutions and niche management for the same, rather than focusing on niche management in relation to technologies only.

**Figure 12: The various stages of scaling-up that a level sustainable agriculture (SA) initiative can reach before it hits a ceiling (IIRR,1999)**



### *Resilience and sustainability thinking*

We already started looking for ways to elaborate on the MLP in relation to landscapes. There are also opportunities to expand views by exploring the connection between ideas on social-ecological resilience and sociotechnical transitions to explore implications for e.g. sustainability governance (Smith and Stirling, 2008). "Social-ecological systems and socio-technical systems are each understood to display complex, multi-scale and adaptive properties; and the associated recommendations for the sustainable governance of these systems emphasises approaches based on learning, experimentation and iteration. Such similarities are encouraging dialogues between the two literatures (...). There are strong parallels between the challenges faced in social-ecological and socio-technical systems research."(:25).

Resilience relates to a capability to respond to shocks, to an ability to adapt and to an ability to 'shift gear' so as to adjust to new conditions. Resilience thinking has been developed in relation to the concept of socio-ecological systems (e.g. Folke, 2006) and sustainable development (e.g. Pisano, 2012). Socio-ecological systems can be described as integrated systems of ecosystems and human society with reciprocal feedback and interdependence (Pisano, 2012). Socio-ecological resilience relates to three important characteristics: (1) The amount of disturbance a system can absorb and still remain within the same state or domain of attraction; (2) the degree to which the system is capable of self-organization; and (3) the ability to build and increase the capacity for learning and adaptation (Folke, 2006). Further developing this distinction, Folke et al. (2010) distinguish between three dimensions in relation to three aspects of socio-ecological systems: resilience as persistence, as adaptability, and as transformability. These dimensions of resilience keep a socio-ecological system within a 'stability domain' (Folke et al., 2010). The earlier discussion system equilibrium illustrate the nature of such domains. In this perspective, adaptability relates to the capacity of socio-ecological systems to adjust and allow for development within the existing stability domain. Transformability relate to the capacity to create new stability domains, which involves novelty and innovation. "Transformations do not take place in a vacuum, but draw on resilience from multiple scales, making use of crises as windows of opportunity, and recombining sources of experience and knowledge to navigate socio-ecological transitions from a regime in one stability landscape to another (Folke et al., 2010).

We see a clear link to the MLP model here, where the focus is now not on socio-technical transitions, but on socio-ecological transitions. Folke et al. (2010) therefore argue that "deliberate transformation involves breaking down the resilience of the old and building resilience of the new". Hence, processes of scaling (up) novel/deviant practices as part of transformation and transition processes, involve a resilience dimensions. Sometimes, scaling (up) will require adaptation within the stability domain, but sometimes it will require the creation of a new stability domain. Obviously, this involves different types of processes of scaling (up) and will require different approaches/strategies.

### *Practice theory*

Practice theory provides another angle on scaling (up) processes by not linking this to systems, but to clusters of practices. It points to the fact that scaling up (aspects of) a particular practice, of necessity will lead to a upscaling or downscaling of (other) (aspects) of different practices as they are part of constellations of bundles of practices. In the metaphor of a jigsaw puzzle we may see different practices have different shapes and the reshaping of form and shape of the practice makes it perhaps fit better or worse in the overall picture (of constellations of bundles of practices), where the overall picture relates to the aspired futures. The significance of practice theory is its move away from thinking in scales as levels (from a flat ontology perspective), which may in some cases be a helpful perspective to understand scaling processes better.

### *Social entrepreneurship*

In the context of MLP, social entrepreneurs play a key role in niche experimentation and are considered to play a key role in scaling (up) processes. Entrepreneurs are essential drivers of innovation and progress

(see e.g. Bornstein, 2007; Bloom and Skloot, 2010). "In the business world, they act as engines of growth, harnessing opportunity and innovation to fuel economic advancement. Social entrepreneurs similarly tap inspiration and creativity, courage and fortitude, to seize opportunities that challenge and forever change inequitable systems. The social entrepreneur aims for value in the form of transformational change that will benefit disadvantaged communities and, ultimately, society at large. Social entrepreneurs pioneer innovative and systemic approaches for meeting the needs of the marginalized, the disadvantaged and the disenfranchised – populations that lack the financial means or political clout to achieve lasting benefit on their own"[15]. This highlights the role of experimenters where deviant practice is born, which sometimes emerges from crazy, counterintuitive solutions[16]. Such ideas/solutions seem to be rather launched by social innovators than nurtured in niches. It points to the fact that niche management is not the only way of supporting processes of scaling up and out.

15 Source: http://www.skollfoundation.org/aboutsocialentrepreneurship/whatis.asp10.

[16] Rafe Furst at http://emergentfool.com/2009/10/07/a-theory-of-scalability/ (accessed 27 May 2013) who discusses initiatives by Bunker Roy who worked with poor, illiterate grandmothers to bring solar electric installations to rural villages, working with illiterate trainers. http://www.ted.com/speakers/bunker_roy.html.

# 4 Challenges in scaling up and out

To some extent, we already started exploring challenges in connection with the multi-level perspective in the previous chapter. We will expand this exploration in this chapter. Finding and then implementing appropriate strategies for scaling up and out is challenging for a number of reasons. Failing to address those challenges will lead to being misguided in the development and implementation of our plans and strategies. We will explore challenges to scaling up and out along the following dimensions:

- Complexity, causality, and systems
- Theories of change – how we think change happens
- Ideas on progress and development – how we want change to happen

## 4.1 Complexity, causality, and systems

In this section we briefly explore some challenges as related to the nature of the world in which we live, of which we try to make sense and to which any scaling ambitions we have, will need to connect. Complexity, causality and systems are related concepts. We discuss them as separate topics while acknowledging the need for understanding them interactively. Complexity points to the fact that we need to be cautious in messing with situations where we cannot oversee all actors and factors that are at play. Causality is about cause-effect relationships, which we often assume to know, but which we every so often don't. Systems are about coherence of scaling processes. If we mess with one scaling processes, it will have wider implications than just for that where we intend to have an impact.

### *Scaling in the face of complexity*

Complexity thinking relates to both a general approach to and theoretical perspective on reality. Much of it closely relates to systems thinking, emphasizing complexity of systems. Ramalingham, Jones, and Toussaint (2008) identify three sets of complexity science concepts:

**Box 6: Complexiity concepts (adapted from Ramalingham, Jones and Toussaint, 2008).**

Set one: Complexity and systems - features of systems which can be described as complex:

- Systems are characterised by interconnected and interdependent elements and dimensions
- Feedback processes crucially shape how change happens within a complex system.
- Emergence describes how the behaviour of systems emerges – often unpredictably – from the interaction of the parts, such that the whole is different to the sum of the parts.

Set two: Complexity and change - phenomena through which complexity manifests itself:

- Within complex systems, relationships between dimensions are frequently nonlinear
- Sensitivity to initial conditions highlights how small differences in the initial state of a system can lead to massive differences later (e.g. butterfly effect)
- Phase space helps to build a picture of the dimensions of a system, and how they change over time. This enables understanding of how systems move and evolve over time.
- Chaos and edge of chaos describe the order underlying the seemingly random behaviours exhibited by certain complex systems.

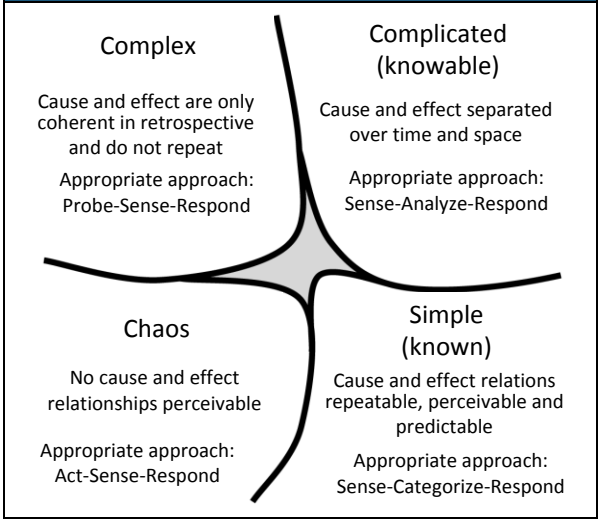
Set three: Complexity and agency - adaptive agents, and how their behaviours are manifested in complex systems:

- Adaptive agents react to the system and to each other, leading to a number of phenomena.
- Self-organisation characterises a particular form of emergent property that can occur in systems of adaptive agents.
- Co-evolution describes how, within a system of adaptive agents, co-evolution occurs, such that the overall system and the agents within it evolve together, or co-evolve, over time.

Paina and Peters (2011) point to the need for incorporating a complexity lens on scaling (up) processes in the context of health services. According to them "the blueprint approaches to scaling up health services commonly found in global health initiatives do not fit the dynamic and unpredictable ways in which health services can expand and be sustainable". The same applies to AR4D.

Scaling involves the complexity of working across levels, scales and dimensions of change. Kurtz and Snowden (2003) emphasized the importance of understanding the nature of systems (in terms of complexity) involved in an envisaged change process. This allows for treating different situations in different ways according to the extent to which causal relationships are difficult to understand. They developed what has become known as the Cynefin framework (figure 13), which identifies four natures of systems we may find, and a fifth that is a kind of transitory state indicating that systems change over time where they may start as simple, but turn complex, or the other way around. Any identification of a system according to the four categories is relative in time and does not relate to a fixed state. The following characterizes appropriate approaches to diversifying the way in which we engage with a particular situation:

**Figure 13: The Cynefin sense-making framework by Kurtz and Snowden, 2003.**




- If it is simple: Cause and effect is predictable and the appropriate response to definable situations can be codified in standard operation procedures which then drive interventions.
- If it is complicated: Cause and effect may be unclear at the time, but can be inferred using data, analysis and expert knowledge. Once understood, rules for intervention can be defined and followed.
- If it is complex: Cause and effect may be identifiable in retrospect, but is unlikely to conform with prior expectations of how things work. Interventions must be flexible as outcomes may be unforeseen.
- If it is chaos: Cause and effect relationships may be speculated in retrospect but cannot be validated. Interventions must be approached as a learning exercise: act, sense and then revise if necessary.

The key message from the Cynefin framework is that we need to differentiate between situations in terms of how we try to intervene, including how we think about scaling up and out.

### *Difficulties of really understanding causal relationships*

The field of causality is not uncontested. There are a number of theories around regarding the existence and nature of causal relationships. Often, our explanation of causal relationships is based on theoretical models that we developed. The strength of the argument for the causal relationship will then depend on the qualities of the model. This makes it problematic to understand causal mechanisms as they may in fact mean something different to different people (Gerring, 2009).

Bradford Hill pointed to a number of aspects of an association needed to be considered to distinguish causal from non-causal associations in the epidemiological situation. We think it holds some keys to how we may think about causation in the context of scaling (up) processes. To what extent are we able to be clear about expected outcomes of scaling processes in terms of:

1. Strength: Refers to the numerical strength of the correlation between relevant variables;
2. Consistency: Refers to phenomena that have been observed in many places at many times by many different observers in different circumstances;
3. Specificity: Refers to effects are e.g. limited to certain people in specific situations;
4. Temporality: Refers to the direction of causality. This aspect is particularly relevant when slowly progressing processes make it unclear what exactly causes what;
5. Biological gradient: Also referred to as a dose-response relationship, when an increment of the supposed cause is associated with an increase in the response. E.g. does the application of ever more fertilizer lead to ever higher yields?
6. Plausibility: Refers to the scientific credibility of the relationship;
7. Coherence: Refers to the idea that the possibility of the causal relationship should not conflict with other relevant (established) knowledge (adapted from Bradford, 1965).
8. Not unimportantly, the delay between cause and effect, complicates the identification of the relationship, while at the same time referring to additional causal factors (which relate to the delay).

The above aspects of causal relationships challenges ideas about how scaling works and how it work out. We will often need to work with our best bets. It then becomes important to establish a shared and agreed reference framework regarding assumed causal relationships among key stakeholders during the design phase of an initiative. An evaluation performed against such (explicit) reference framework then needs to worry less about (costly) establishing of 'scientific proof', which may prove to be elusive (at least in terms of providing conclusive evidence, see e.g. Bold et al., 2013).

### *Limited control of system dynamics*

There is a family of systems approaches and theories (see e.g. Ison, 2008) which can produce enough perspectives on scaling (up) to fill a book. A systems perspective in reality emphasizes the interconnectedness of elements that make up systems. Hence, scaling (up) in this perspective requires understanding how scaling works in such interconnectedness. If we scale (up) one thing in a system, what happens to other system elements? Such interconnectedness lead Donella Meadows (2009) to state that we should stop being blinded by 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). Ulanowicz (2005) further illustrates Meadows' statement that we should not be blinded by the illusion that we can control systems when he discusses ecosystem properties, which apply to agroecological systems as well. The following illustration he gives are very much along the lines of what we discussed in section 3.1 in relation to complications in detecting causality and causal relationships:

- Ecosystems are not causally closed in that they appear to be open to the influence of non-mechanical agency. Spontaneous events may occur at any level of the hierarchy at any time. Efficient (or mechanical) causes usually originate at scales inferior to that of observation, and their effects propagate upwards. Formal agencies appear at the focal level; and final causes exist at higher levels and propagate downwards (...);
- The realm of ecology is granular, rather than universal. Models of events at any one scale can explain matters at another scale only in inverse proportion to the remoteness between them. (...);
- Ecosystems, like other biotic systems, are not reversible, but historical. Irregularities often take the form of (often singular) discontinuities, which degrade predictability into the future and obscure hindcasting. The effects of past discontinuities are often retained (as memories) in the material and kinetic forms that result from adaptation. Time takes a preferred direction or telos in ecosystems – that of increasing ascendency;

– Ecosystems are not easily decomposed; they are organic in composition and behavior. Propensities never exist in isolation from other propensities, and communication between them fosters clusters of mutually reinforcing propensities to grow successively more interdependent. Hence, the observation of any component in isolation (if possible) reveals regressively less about how it behaves within the ensemble (Ulanowicz, 2005: 12-13).

### *Cutting corners in natural resource management and socio-ecological systems*

Natural resource management is about use of natural resources for purposes that serve humankind. It is about reaping the benefits from a multitude of resources and processes that are supplied by ecosystems. Collectively, these benefits are called ecosystem services. "For thousands of years humans have purposefully and inadvertently modified ecosystems through the manipulation of ecological processes and ecosystem structures. Agriculture, for example, attempts to alter ecosystem goods such as biodiversity and ecosystem services such as water movement in order to increase specific types of ecological production. Yet, as humans increase the supply of desired ecosystem services by simplifying and homogenizing ecosystems, unwanted side effects emerge. The simplification and stabilization of these systems tends to reduce their ability to reliably supply services, even as human society becomes more dependent upon their presence" (Gunderson, Peterson and Holling, 2008: 223). "This pattern of ecosystem modification has been described as the pathology of resource management – where simplifying and stabilizing ecosystems has the unintended consequence of increasing their vulnerability (...). The pathology results from the unexpected response of complex systems to simple management approaches and has been increasingly problematic as both the scope of humanity's alteration of the biosphere (...) and the number of people dependent upon the reliable supply of ecosystem services has increased (:223)[17].

Stirling (2013) argues for fostering (socio-technical) diversity and strategy plurality so as to reduce vulnerability that comes from working with only a limited set of strategy options (see also Cumming and Norberg (2008) on the role of diversity). This is all about the ability to "shift gear" when necessary (also see discussions in the previous section on MLP). We may add to this the need for methodological plurality in relation to monitoring and evaluation, which enhances the ability to pick up relevant and in particular weak signals that tend to be filtered out or which are simply not picked up. Dave Snowden developed an interesting methodological option that helps picking up weak signals in social systems[18].

Aligning the scale of demand for ecosystem services with the scale at which ecosystem services can be sustainably provided, which is about solving the problem of socio-ecological scale mismatches. (Cumming et al., 2012). Fostering appropriate institutions that will act flexibly, proactively and at appropriate sclae to strengthen feedbacks that modify and moderate demand for ecosystem servics and incorporate the tradeoffs between human wellbeing, profit and the exploitation of ecosystems (Cumming et al., 2012), the same idea which we find in the People-Planet-Profit approach. Stirling (2013) argues for working with contrasting governance strategies which in a way simultaneously sustain stability, durability, resilience and robustness. So not opting for one or the other to mitigate "the danger of globalized technological monocultures by pursuing instead a more deliberate diversity of contending technological trajectories (:31). The landscape approach attempts to address institutional constraints especially in terms of the way institutions are organised where different parties/stakeholders work with different dimensions of scales (e.g. business looks at value chains, government look at administrative units, farmers look at the locality).

[17] United Nations (2010) states that if the current development transition were to follow the same consumption and production patterns, pressure on critical ecosystems and life-support systems would become intolerable. They advocate for a combined upscaling and downscaling approach: "we must find pathways which simultaneously achieve upward convergence of living standards (...) and downward convergence of resource use and environmental impacts (...)."

[18] http://www.sensemaker-suite.com/smsite/index.gsp

This involves critical roles for intermediaries, not just in terms of innovation, but also in relation to forging connections across scale. We may call them cross-scale intermediaries.

### *Missing out on cross-scale dynamics*

Cumming, Cumming and Redman (2006) "hypothesize that many of the problems encountered by societies in managing natural resources arise because of a mismatch between the scale of management and the scale(s) of the ecological processes being managed" (:14). They describe scale mismatches as occurring "when the scale of environmental variation and the scale of social organization in which the responsibility for management resides are aligned in such a way that one or more functions of the social-ecological system are disrupted, inefficiencies occur, and/or important components of the system are lost. They are generated by a wide range of social, ecological, and linked social-ecological processes. Mismatches between the scales of ecological processes and the institutions that are responsible for managing them can contribute to a decrease in social-ecological resilience, including the mismanagement of natural resources and a decrease in human well-being. Solutions to scale mismatches usually require institutional changes at more than one hierarchical level. Long-term solutions to scale mismatch problems will depend on social learning and the development of flexible institutions that can adjust and reorganize in response to changes in ecosystems". Borgström et al. (2006) further push this argument by stating that "in many conventional natural resource management regimes, incomplete knowledge of ecosystem dynamics and institutional constraints often leads to institutional management frameworks that do not match the scale of ecological patterns and processes" (:16). They propose two strategies for overcoming such scale mismatches: "1) development of an integrative view of the whole urban social–ecological landscape, and 2) creation of adaptive governance systems to support practical management"(:16).

Some of the complications in understanding cross-scale dynamics include (Evans, Ostrom and Gibson, 2005):

- The large scale is likely to have at least some characteristics we cannot predict at all from a knowledge of the small scale. The small scale is likely to have at least some characteristics (:92).
- Phenomena are observable at some scales while unobservable at others (:100).
- The nature of relationships changes with scale, so that even if a relationship is observable at multiple scales, the magnitude or strength of that relationship may differ across scales (:100).

This means that the concepts of macro vs. micro and of scales in the social and in the physical science are widely used, but not without problems. The discussion of cross-scale dynamics relates closely to the discussion by e.g. Menter (2004) on fallacies along the lines of scaling up:

- 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 researcher does something, all researchers assumed to be like that.

### *Engaging with wicked problems*

Wicked problems involve multiple interacting systems (social, ecological, and economic), a number of social and institutional uncertainties, imperfect knowledge, and incompatible stakes (Conklin, 2005). We may therefore consider the measure of wickedness to be a function of:

- Number of interacting systems.
- The level of inertia/stability of systems (and institutions).

- Number of social and institutional uncertainties.
- Level of knowledge/understanding about the issues at hand.
- The level of compatibility of ideas on how to deal with the issue at hand.

Wicked problems relate to Murphy's law. Throw a bunch of electrical cords in a box en later try to pick out one in the middle. Issues tend to get intertwined. We need actors who are able to untie knots, not expecting that things get permanently untied. In the future they will get intertwined again. There is a tendency to try to get wicked problems out of the way, by so-called 'solving' them, but we need a longer-term perspective (Hartmann, 2012). As figure 14 in the next section illustrates, we often are dealing with a myriad of intertwined scaling processes within which we try to foster particular scaling processes. But as we are trying to do so, we often cannot avoid triggering other scaling processes some of which we will not have anticipated and some which may turn out to create negative impact such as we discussed in relation to scale mismatches earlier.

## 4.2 Theories of change

We discussed some dimensions of complexity, causality and systems as features of the nature of the world in which we live. In our sense-making of this world, we develop what we may call 'theories of change', in which 'theory' is not just understood in the formal sense of the word. It relates to how we think change happen. It includes ideas on how we think scaling happens. The question is whether such theories of change are in line with actual realities (e.g. concerning causal relationships). The fact that in many development initiatives we find poorly articulated theories of change means that a certain measure of wishful thinking about change (and scaling) will be involved. We briefly explore some ideas along these lines in this section.

### *Being transparent and learning about how we think change happens*

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. In times 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, much of the underlying ideas on how change happens (theories of change), is not made explicit. This may result in wishful thinking (dreaming into the future) and conflict during implementation when differences between stakeholder's theories of change become apparent. Partly for this reason, we have seen an increased interest in the subject of 'theories of change' (ToC) over the past decade, with development financiers increasingly requiring proposals to contain an articulated theory of change which includes descriptions of important assumptions about envisaged change processes (see e.g. Vogel, 2012, and Stein & Valters, 2012). Cohen and Easterly's edited book on 'what works in development' (2009) points to an articulation of assumptions on how change happens or even how good change happens.

> "If the only tool you have is a hammer, you tend to see every problem as a nail"
> Abraham Maslow, quoted by Reeler, 2007

The importance of making theories of change explicit is also illustrated in the discussion of the difference between 'espoused theory' and 'theory-in-use'. Espoused theory refers to worldviews and values which people believe guide their behaviour, and theory-in-use refers to the worldviews and values which actually drive their behaviour as evidenced in their behaviour (Savaya and Gardner, 2012). Savaya and Gardner point out that few

**Assumed scaling mechanisms**
It used to be (and perhaps still is) widely believed that the accumulation of wealth by the rich would be good for the poor as some of the increased wealth of the rich would trickle down to the poor. We may see this as an assumed scaling mechanism. In 2011, however, OECD, in the report "Divided we stand. Why inequalities keep rising", challenged the trickle-down theory as unfounded in many cases.

people are even aware of the fact that for them there is a difference between espoused theory and theory-in-use. The increased interest in having theories of change articulated may be seen as an attempt to get the theory-in-use clear in proposals rather than the espoused theory. Espoused theories in proposals also refer to assumed theories of change of financiers ('what do they want to hear').

The 'diffusion of innovations' idea (Rogers, 2003), is an example of a theory of change in relation to a particular subject. As discussed earlier, this theory may be seen as an attempt to find a scaling law or theory in the social realm. He defined a number of reasons for 'innovations' going to scale:

- Relative advantage (over existing product or practice)
- Compatibility with existing values and practices
- Simplicity and ease of use
- Trialability (on limited basis)
- Observable results (or visibility of results)
- Reinvention (allowing modification/adaptation)
- Conducive communication (networks, peer-to-peer)

The use of terms such as 'unexpected side-effects' and 'externalities' which may be observed in evaluation, point to an initial failure to understand what would go to scale as an effect of interventions.

We may say that this is the theory of scaling (change) in relation to innovations, according to Rogers. Of course, this is not the same as spelling out the roadmap of innovations successfully going to scale. It leaves many questions open, such as: how will we assess 'advantage', when is something compatible, when is something simple enough, etc.

Possibly the key frontier in terms of addressing known causal relationships in development practice is the one on institutional change. Innovation/change in technical dimensions is something we seem to be pretty much on top of, but institutional conditions remain one of the key concerns in seeing change happen. Röling (2011) discusses this topic, looking for mechanisms of institutional innovation (particularly in relation to smallholder support), such as price formation, farmer representation, land/water tenure, and diversification of organisation. The use of identifying such mechanisms and indicating their relevance in a particular change process lies in the opportunities for then monitoring the status of such mechanisms systematically during a change process. Once a framework regarding relevant mechanisms can be agreed upon as key stakeholders, evaluation in relation to this becomes more meaningful.

In any case, having studied various perspectives on how change happens, Krznaric (2007) concludes that "that there are no generally applicable models of how social change happens. Every context has its own history and its own particularities.(...). The past is not a definitive guide to the future." (:30).

### *Anticipating scaling processes into the future*

Understanding trends (how things will evolve into the future), means understanding something important about change processes. It asks for understanding causal actors and factors, causal mechanisms, emergence and more. Understanding trends relates closely to the idea of scaling. A trend is a kind of scaling process which we may detect. Scaling (up) strategies need to connect to such trends. A technology may respond to one trend, but not another. For this purpose, models and associated simulations are developed so that we can develop an appreciation of possible trends that we will need to respond to. These simulation models are used to predict e.g. effects of policies

**Box 7: They did not see change coming**

- "Stocks have reached what looks like a permanently high plateau": Irving Fisher, Professor of Economics, Yale University, 1929
- "Inventions have long since reached their limit, and I see no hope for future development": Roman engineer Sextus Julius Frontinus, 1st Century AD
- "Heavier than air flying machines are not possible": Lord Kelvin, President of the Royal Society, 1895
- "We don't like their sound, and guitar music is on the way out": Decca Recording Co. rejecting *The Beatles*, 1962.
- "There is no reason anyone would want a computer in their home": Ken Olson, founder of Digital Equipment, 1977

and are based on assumed scaling or power laws (e.g. Katz, 2006). This is critical for policy making as well as in strategy development, but they often involve a number of assumptions relating to a particular understanding about mechanisms (groups of interactive causal relationships). Only the future will tell whether the model is picking up the right signals.

So we need a series of instruments to create an idea of how scaling may unfold into the future, such as trend analysis (e.g. UN (2010) on trends in sustainable development) and multiscale scenario analysis which link scenarios of e.g. socio-ecological systems across multiple spatial scales (e.g. discussed by Biggs, et al. (2007) and Zurek and Henrichs (2007) who discuss linking scenarios across geographical scales in environmental assessments.

Such understanding helps to know what we need to be ready for from a long-range perspective and if necessary, issue warnings (e.g. OECD (2012) warning about the consequences of inaction in view of the environmental outlook to 2050). It also helps to find out critical uncertainties we need to respond to (The Rockefeller Foundation and Global Business Network, 2010) and in developing new development agendas beyond 2015 by picking out the most important trends that we need to respond to as well as the relevant indicators that will tell us how we are faring in relation to these trends (e.g. Bates-Earner et al., 2012 and United Nations Committee for Development Policy (2012).

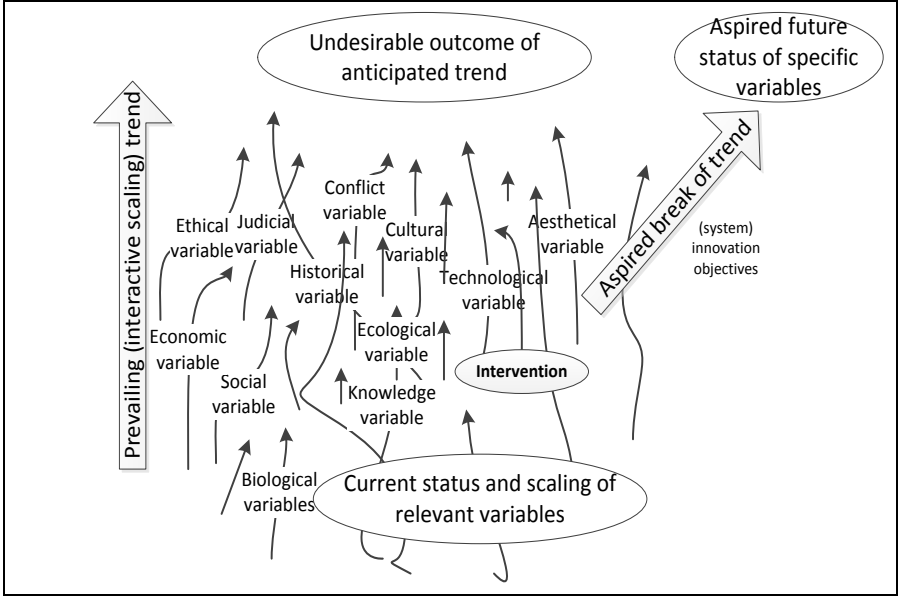
Resulting scenarios, relating to different types of trends, will need to be linked across scales to:

- Adequately address multiscale processes, assess crossscale interactions and analyse feedbacks;
- Make use of existing information at different scales, i.e. to translate global trends to local pressures, and vice versa;
- Bring together researchers, stakeholders and decisionmakers from different geographical scale (Loveridge, 2009).

### *Being aware of interacting scaling processes*

Development initiatives tend to focus on particular scaling processes which are deemed desirable. They often fail to realise that scaling processes are happening continuously across levels and dimensions. Figure 14 illustrates that such initiatives in fact seek to break a trend in scaling processes. If the undesirable outcome of anticipated trends relates to multiple interacting scaling processes, just focusing on changing trends in relation to one or two variables will have limited effect. It is not difficult to understand that the 'reconfiguring' of interacting scaling processes may also have a number of side effects which were not anticipated due to the focus on particular variables only.

**Figure 14: Interventions in the context of multiple, on-going scaling processes**



### *Prevent only learning late lessons from early warnings*

We close this section by sharing an overview of erroneous assumptions made in initial evaluations of environmental hazards and the subsequent recognition of the true complexity (Grandjean, 2013:630), which points to our tendency to cut corners in our acceptance of evidence of how change happens:

**Box 8: Late lessons from early warnings**

| Initial assumption | Late scientific lesson |
|---|---|
| 1. Presence of environmental chemicals in the body can be tolerated at 'safe' or natural doses | Delayed effects, cumulated or re-mobilised doses, or toxic metabolites may occur at exposures previously thought to be safe |
| 2. Absence of harm in adult male workers (from routine medical data or mortality) means absence of risk to the general public | Sub-populations, such as children and the elderly, may be more vulnerable to the exposure |
| 3. Acute or short-term effects also reflect chronic or long-term effects | Dose-response relationships for acute effects may substantially differ from those for chronic effects |
| 4. Biological effects may not necessarily be adverse and can be considered harmless | Early changes can predict more serious adverse effects which can develop later on |
| 5. Dose-response relationships are consistent (and 'monotonic'), and no risk occurs at doses below apparent thresholds | Some substances show 'low dose' effects that are not readily predictable from responses to high doses |
| 6. Short-term assessment of exposures from a single pathway can generally be considered sensitive and valid | Most methods for exposure assessment are imprecise, and imprecision usually results in underestimation of the toxicity |
| 7. The placenta and the blood-brain barrier amply protect sensitive life-stages and organs from toxic chemicals | The barriers may be bypassed, as they offer limited protection against industrial chemicals |
| 8. Average findings in exposed subjects indicate the potential for harm to the exposed population | Sensitive sub-groups may show effects that are not apparent from the average data |
| 9. Toxicity evidence from animals and wildlife is not relevant to human toxicity | Animal data have reliably predicted most known carcinogens and many other hazards, and humans may be more vulnerable than other species |

Much of the above sums up to concerns about a lack of revisiting foundations upon which current world-systems are built, including mind-sets, paradigms and prerogatives. What we take to scale will often be rooted in such foundations and if something is wrong in those foundations, consequently, scaling up or out will exacerbate this.

## 4.3 Ideas on progress and development

### *Scaling often involves contested ideas on how we want change to happen*

Apart from our theories of change regarding how we think change happens, we also entertain ideas regarding how we would like change to happen. This relates to our preferences, our ideologies and convictions. In history, such ideas on progress and development have been a key driver of human behaviour, from cultural expressions right up to warfare. Development models are not only informed by how we think change happens, but also by how we want change to happen. Processes of scaling up and out are not immune to such ideas and associated development models. The scaling of practices and ideas and in particular the implication/ consequences of those for society, are often the object of societal concerns. One such concern is the practice of monoculture (see e.g. Grain 2006; Michaels, 2011; Uekoetter, 2011) in the context of agriculture, which is the result of a process of scaling out a certain practice, technology and/or (cropping) system. Other concerns relate to e.g. cultural issues, which has been captured in literature such as on 'the McDonaldization of society' (Ritzer, 1998/2012; Smart, 1999; Drane, 2012) and on the idea of mono-culturalism (Conversi, 2007).

### *Scaling processes are usually not value-free*

Andersson (2011) describes societal concerns as norms or generally accepted values in a society, which can be seen as part of a society's identity and which are shaped by traditions, culture, worldviews, past experiences and level op development of the society in question. They apply to ideas regarding ethics, aesthetics as well as justice. From this perspective, societal concerns will be different in different societies and they are not constant, but evolve over time. Societal concerns may relate to different things. In agriculture, food prices may be the concern. In low-income countries, that will often be the primary concern. In high-income countries, food quality will be considered more important.

Societal concerns about scaling processes include:

- Who really benefits from scaling? How does the scaling of various development models work out for those who are considered to need it the most (Bailey, 2011; Leach, Scoones & Stirling, 2010; Melber, 2012)?
- How does the idea of finding models to go to scale relate to issues of power, control and freedom? Scaling out models implies a certain extent of copying, of replicating, of standards in order to ensure getting more of the same. It necessitates a certain measure of compliance. It also implies that the original idea came from somewhere else. It is not a homebrew, which affects ownership feelings of those who are meant to adopt the model. What freedom is there to change the model or even refuse the model? See e.g. discussions by Page, 2008; Oxfam, 2009; Kuonqui, 2006; Max-Neef & Smith, 2011; Basu & Kanbur, 2009; Boym, 2012; Sen, 1999; Schumacher, 1973; Deneulin & Shahani, 2009.
- Could it be that the very idea of scaling out and consequently getting more of the same, holds an inherent risk of rigidity and loss of diversity, particularity, individuality and unique identity? What is the role of diversity (which results from processes opposite to scaling up) for the social resilience of society (see e.g. discussions by van der Ploeg & Long, 1994; Hubbard, 2004; Reeves, 2005; Anheier & Raj Isar, 2007/2010; Appelbaum & Robinson, 2005)?

As mentioned earlier, scaling up and out is often not a value-free endeavour. Apart from people's perceptions of how change happens, it also involves people's ideas on (preferences regarding) progress and development. This leads to different rationalities. Each rationality has its own rational story of the situation concerned and what action should and should not be taken. Engaging in processes of scaling up and out will include the need to engage with such plurality of rationalities (multi-stakeholder perspectives). "The complexities of handling the interactions between the many actors and institutions involved — governments, policymakers, businesses, entrepreneurs, scientists, civil society representatives, citizens and the media. Each comes to the debate with different and often conflicting knowledge, perceptions, interests and priorities; balancing these numerous and often antagonistic positions should be seen as a prelude to making decisions on those innovations that have broad societal implications (EEA, 2013:671-672). We will continue this discussion in the next chapter along the lines of the need for responsible research and innovation.

The different ideas on progress and development will translate to different perspectives on what we want and what we do not want to go to scale, as well as on how we want things to go to scale and how not, and on who/what should benefit from scaling processes. This calls for appropriate governance of scaling processes where we may benefit from ideas on governance strategies for dealing with wicked problems Termeer et al. (2012).

# 5 Principles of and options for responsible scaling

## 5.1 Why responsible scaling?

Agricultural development is not a value-free endeavour. "Agricultural policies have always had a tendency to be controversial. In many cases they generate major transfers of welfare between different groups of people, and hence are favoured by some and criticised by others. They also frequently cause trouble at the international level as domestic programmes interfere with trade flows and affect the wellbeing of people in other parts of the world. In addition (...), agricultural policy makers have more recently been faced with several issues that are even more controversial. Animal welfare, environmental implications, genetically modified organisms (GMOs), quality and safety of food products and social conditions of production are just a few examples of issues where modern societies have concerns, often arising out of widely diverging views on what is right and wrong. Responding appropriately to such societal concerns (...) has often proven difficult for policy makers." (Tangermann, 2010 in the OECD's workshop report on policy responses to societal concerns in food and agriculture).

Furthermore, Westley et al. (2011) argue that 'the increase in our knowledge about our role in the environment cannot keep pace with the increase of the unknown impact of our actions'. In relation to this Bawden (1997) discusses ethical dimensions of agricultural research. He quotes Churchman (1971), who observed that the most important feature of systems approaches is that they are "committed to ascertaining not simply whether the decision maker's choices lead to his [sic] desired ends, but whether they lead to ends which are ethically defensible". He goes on to argue that "the issue of the globalisation of risks which have arisen through the application of technoscience to agriculture, is certainly sufficient reason alone for we agricultural scientists to question the ethical defensibility of our actions. It should encourage us to become self-critical, not just of the outcomes of our processes of inquiry, but of the very nature of those processes (...)".

Bulloch, Lacy and Jurgens (2011) argue that over the past decades, we have seen an increasing convergence of issues, interests and solutions. This asks for finding coherence and alignment in the work of key actors. It relates to developing shared visions for the future in terms of interacting themes such as people's values, human development, economy, agriculture, forests, energy and power, infrastructure, mobility and materials (:26). There is an increasingly recognised need for an interplay approach of consumers, business, government and technology as discussed in relation to the scaling of sustainable consumption and resource efficiency (World Economic Forum, 2012). An approach to scaling (up) needs to match such convergence perspective with a common vision along the lines of creating room for sustainability governance as overarching coordination framework. Last but certainly not least, convergence needs to be inclusive. This relates to some of the societal concerns we discussed: e.g. what about the bottom billion? Responding to ethical, political, social and ecological concerns requires decompartmentalization of single-disciplinary, single-sectoral, and single-scale efforts both in study and practice (Fry, 2008). Convergence needs to translate to a decrease of scale mismatches, which points to the need for interplay towards coherence and alignment across scales and dimensions. However, within all convergence and hybridization of theoretical and practical perspectives, we need to allow for the 'art de la localité' (van der Ploeg, 1993), the more culturally defined choices made in how we develop practices and what we consider to be appropriate and preferable. This means that convergence (which in fact involves scaling of e.g. common ideas) should not come at the expense of diversity and foundational (cultural) identity as also discussed earlier along the lines of resilience thinking.

***Responsible research and innovation***

Responsible innovation is about finding an acceptable match between what we can do and what is good to do. As discussed elsewhere in this paper, science and innovation introduce technologies and institutional

designs, but also ethical dilemmas and impacts which are often uncertain and unpredictable. The resulting question is how we can carry out science and innovation responsibly so that it contributes to socially acceptable and desirable goals in ways that are democratic, equitable and sustainable (Owen, Bessant and Heintz, eds., 2013).

"Responsible research and innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other regarding the ethical acceptability, sustainability and social desirability of the innovation process and its marketable products. Social desirability is currently essentially determined by market mechanisms, however, as universal principles on what counts as socially desirable are not easily agreed upon. (...). Indeed, techno-scientific applications can remain ethically problematic even in cases where scientists and engineers have the best possible intentions and users have no conscious intention to misuse or abuse (...). This situation constitutes the major ethical challenge we face today. Ethics focused on the intentions and/or consequence of actions of individuals are not appropriate for allocating responsibilities for the impacts of innovations. Responsible innovation therefore requires ethics of co-responsibility for ensuring the right impacts and avoiding negative consequences, whether these impacts are intentional or not and whether they can be fully foreseen or not. (...) The challenge is to arrive at a more responsive, adaptive and integrated management of the innovation process. (Gee, 2013, based on Von Schomberg, 2013).

"What is envisioned, is a practice that we (...) may call reflexive*:* It is a matter of turning the virtues of science (of knowing and understanding) onto itself, knowing and understanding scientific knowledge and technology better in order to steer it better. This kind of steering heavily involves visions of the good society and the good future, and as such it requires transparency and broad societal debate (Strand and Oughton, 2009:29-30).

There will be obvious differences of opinion regarding the good that may come out of certain (planned) scaling (up) processes. see Sherwood, Leeuwis and Crane, 2012, who talk about their vision for innovation in terms of a world where science and technology work more directly for social justice, poverty alleviation and the environment. This requires innovation which is transformative – reshaping social and power relations to allow innovation in new directions. It also involves an acknowledgement of the moral dimensions of development policy and practice (Schwenke, 2009; Casabona, Escajedo San Epifanio and Emaldi Cirión, eds., 2010). Jochemsen (2012) explores this subject along the lines of normative practice, pointing to a need to prevent letting technical and financial-economic motives rule agriculture, and to incorporate other motives as well.

## 5.2 What does responsible scaling involve?

Scaling up and out in the context of AR4D involves appropriate understanding about interacting scaling processes, about the way in which initiatives would link to and affect those, and what capacities and conditions will be involved in guiding processes of scaling up and out. A choice of approach will often link closely to:

- Levels of complexity involved
- Levels of uncertainty involved
- Levels of capability available
- Levels of concerns applicable
- Levels of ambiguity applicable
- Levels of connectivity required
- And levels of knowledge available

There will be a range of dimensions of the processes of scaling up and out along the lines of which options will need to be compared and choices made:

- What is the nature (type, scalability issues, causal mechanisms involved) of the scaling process?
- What is the context of the scaling process?
- What is the history of the scaling process?
- What levels of scaling are involved?
- What models could help in guiding processes of scaling?
- What is the scope of scaling processes?
- What capacities/capabilities will be needed?
- What timing would be appropriate?
- What investment would be needed?

Too often, approaches to scaling (up) in the context of international development and agricultural development for that matter, are still rooted in linear ideas about modernization and transfer of technology. This puts efforts to scale up and out in a dubious corner of merely being preoccupied with problem solving from a narrow perspective. Scaling strategies can do better than that. 'Scaling up' impact in smallholder agriculture does not mean simply multiplying the number of projects or investing in bigger projects. Rather, it is about doing things in different ways, for example by forming alliances with other actors to leverage greater overall investment. In fact, reliance primarily on donor or INGO resources is likely to lead to 'unsustainable' interventions.

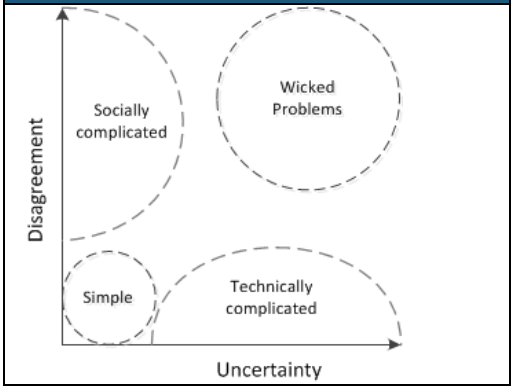
> Complexity theorists believe that what defines successful leaders in situations of great complexity is not the quality of decisiveness, but the quality of inquiry. (Kania and Kramer, 2013).

Ultimately, achieving scale involves employing innovative and self-sustaining strategies to achieve profound change with the potential for positive impacts on the lives of large numbers of poor people" (Wilson, Wilson and Harvey, eds., 2011). The same authors then point to the implications for collaborative efforts: "Interventions can be self-sustaining if they are designed in collaboration with other key actors such as producer organizations, processing companies, district authorities, and providers of financial services. These actors, rather than Oxfam or other NGOs, are the drivers of processes of change, and this requires Oxfam staff and programmes to 'let go' of the process. Diverse 'scaling' mechanisms exist within the agricultural sector. These include the farmer-to-farmer spread of new technologies or production practices; franchising, or adoption of new business models by companies; institutional and policy changes across municipalities, regions, or countries; and increased private or public sector investment in innovative and effective models of service delivery to poor rural people, such as mobile banking and the demand-driven spread of new services and technologies.

Wiggins and Keats (2013) connect to this line of argument when they write that there is a danger in the question of how to scale up 'the best of initiatives', because it expects that the answer lies in a particular or specific arrangement. They argue that if successful cases are to be scaled up to increase their reach and impact then a variety of models and processes must be considered. Scaling up does not lie in a particular and specific arrangement: a particular form of contracting, or an ideal agricultural cooperative:

- Approaches, not form, lead to effective links, and
- What then needs scaling, replicating and adapting are processes of enabling, facilitation and learning,
- Wupported by a necessary architecture that includes

**Figure 15: Appropriately connecting to the nature of situations, systems and practices. Adapted from Patton, 2008**



catalysts of change, forums to consider and address specific problems and mechanisms to group farmers.

Already in 1992, Robert Chambers shared some useful thoughts on scaling up: "Self-spreading and self-improving are also associated with institutional cultures. NGOs [and the same may apply research institutes] which are strictly bounded and territorial are less likely to share, spread, adopt and improve, than those which are open and undefended (Chambers, 1992).

Finding new roles in innovation processes and defining new ways of engaging in scaling processes also relates to developing better understanding about how to work with niches for institutional development, rather than only to be focused on technological niches. This may fit well with Humidtropics SRT3 on scaling and institutional innovation by not being limited to 'take to scale" what e.g. systems analysis and synthesis has set up, but to engage in scaling processes from beginning to end (Humidtropics, 2012).

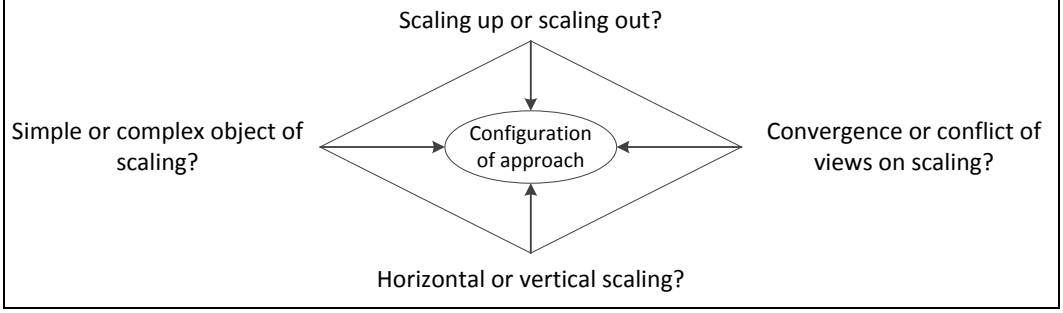
## 5.3 Configuration of an appropriate approach

In the following we are not suggesting a 'best approach', but rather will share ideas on a variety of choices can be made to match an approach to scaling up and out to a specific situation and envisaged development initiative. The following is based on our interpretation of key concepts in section 2.2.

Steps to take in the configuration of an appropriate approach:

1. Appropriate **situation analysis** both in terms of past and current dynamics as well as anticipated future dynamics (scaling processes).
2. What **type of scaling processes** will our initiative engage in (scaling up and/or out; vertical scaling and/or horizontal scaling), and what will be the **nature of** those **scaling processes** (how contested and how complex)?

**Figure 16: Configuration of an appropriate approach to scaling**




3. What would best characterise the process of **scaling (approach)** that matches the specific application context?
4. What are the **implications** for our initiative in terms of a need **for further study** and in terms of required **capacities and conditions** for successful engaging in the envisaged scaling processes?

In the following we will explain these four steps.

### *1. Situation analysis*

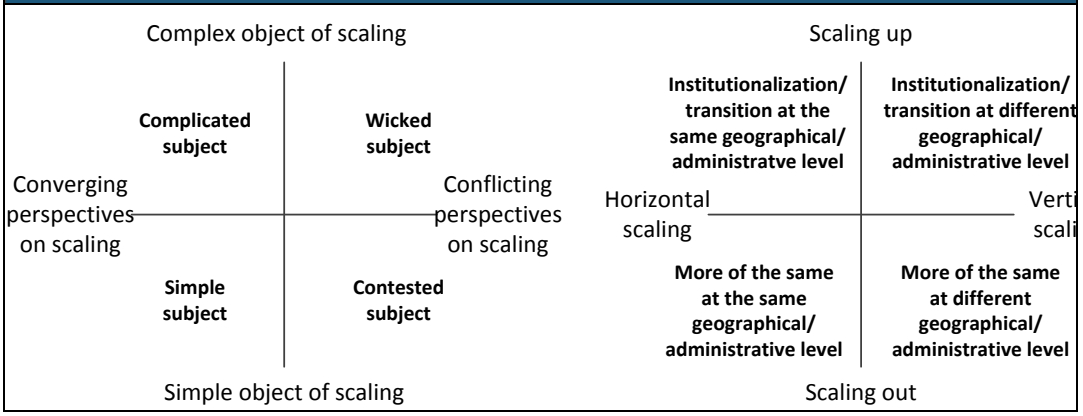
As the Dutch saying goes, 'a good start is half the work'. The better we have a grasp of how our initiatives would link to existing and anticipated scaling processes, the better our starting point for making a meaningful difference. We argue that scaling up and out is not something of a later stage in a programme. It needs to be thought-through as part of the overall design. If there could be only one message in this paper, it would be: "Look before you leap". The extent to which we have 'done our homework' will determine whether such intervening becomes more of a 'messing with' or more of an 'interplay with' scaling processes. Instruments to be used connect to the capabilities and competences we discuss in 5.5.

### *2. Assessing the type of scaling process that applies*

There are four dimensions that help clarify the type of scaling processes that would apply to a particular initiative:

- To what extent is this about scaling up and to what extent about scaling out?
- To what extent is this about horizontal scaling and to what extent about vertical scaling?
- To what extent is this about a simple object (e.g. a tool) of scaling and to what extent about a complex object of scaling (e.g. a cropping system)?
- To what extent is this about a scaling process that involves conflict in viewpoints and/or interests and to what extent is this about an uncontested scaling process?

**Figure 17: Dimensions of scaling processes**




### *3. Assessing what would be an appropriate approach*

Depending on the type and nature of scaling processes, we may opt for different approaches in engaging with scaling processes:

a) Will we take something as a starting point to be scaled, or will we take an aspired future (impact) as point of departure and work with scaling processes that will contribute to arriving at such aspired future. The first focus is more 'product/service-delivery' oriented and the second focus is more process oriented (some authors refer to as "scaling (up) impact").

b) Will we be developing active scaling processes ourselves (as organisation, or group of partners), or will we be connecting to emergent (on-going) scaling processes? The first focus may also be phrased as make-it-happen scaling (control focus) and the second focus as see-it-happen/help-it-happen scaling (context focus). In relation to these two dimensions we may distinguish between four main approaches:

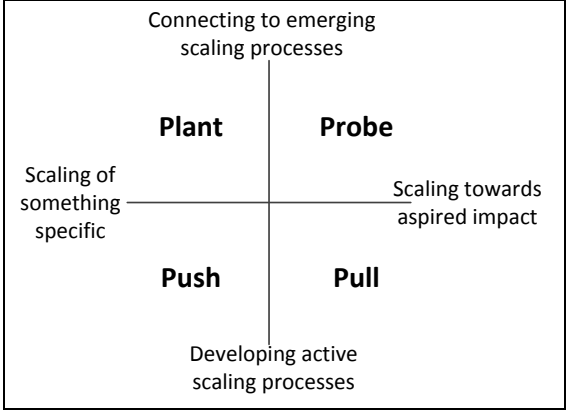
**Push**: We have something that we would like to go to scale and we will work hard to make that happen. It connects to the 'simple' in figure 15.

**Pull**: We have an aspired future in mind and seek to scale up and out that which we think will help make that future reality. It connects to the 'technically complicated' in figure 15.

**Plant**: We have something we would like to go to scale, but such scaling can only happen if we connect other factors and work with other (development) actors. It connects to the 'socially complicated' in figure 15.

**Probe**: We have an aspired future in mind, but are unsure about what scaling processes would be involved in moving towards that future, so we will have to navigate and adapt as we go. It connects to the 'wicked problems' in figure 15.

**Figure 18: General approaches to scaling up and out**



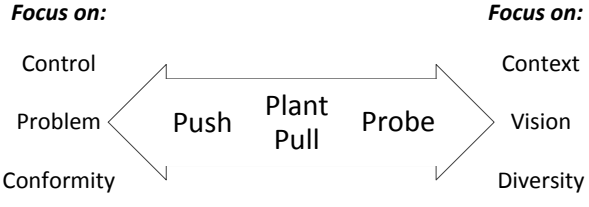

This is not about an either this approach or that approach, but rather about a certain focus where working with combinations of approaches in programmes is possible as well.

### *4. Assessing implications of tentative approach*

First of all, we want to point out that the choice of approach is more than a technical choice of what is most feasible and/or appropriate. As we discussed in 4.3, it may also involves our ideas on progress and development, in other words, our paradigms and worldviews. A choice for a push-approach may be informed by a paradigm focus on seeking to control change processes, on solving problems, and on seeking compliance with what is considered to be 'best practice'. A choice of a probe-approach may be informed by a paradigm focus on seeking to connect to context variability, on designing on the basis of (long-term) vision, and on fostering diversity.

The following table is an attempt to characterize implications of the four main approaches for design, strategy and implementation of initiatives that involve scaling processes. The push-approach will lean more towards the characterisations on the left-hand side, the probe-approach will lean more towards the characterisations on the right-hand side, and the plant- and pull-approaches will relate to characterisations in-between those two.
This should be read as a rough indication only.

**Figure 19: Choice for a particular scaling approach may relate to development paradigms**



| Box 9: Characterization of scaling approaches in terms of what they will incline towards | | | |
|---|---|---|---|
| | Push | Plant Pull | Probe |
| Key concern/risk | Wishful thinking and scaling up what is not appropriate | ⟺ | Too hesitant to do what can be done, leaving too much to emergence |
| Design process | Appropriate identification and selection of products, services, practices | ⟺ | Capitalising on hindsight and foresight; seeking collaboration, networking; cross-scale analysis |
| Needed capacity/ capabilities | Selection and implementation capabilities | ⟺ | Transdisciplinary, integrative, and sense-making capabilities |
| Typical roles of change agents | Implementers | ⟺ | Intermediaries, networkers |
| M&E design | Compliance-focus: do we manage to scale up our 'flagships'? | ⟺ | Context focus: do we manage to forge connections, interaction towards shared efforts |
| Partnership/network arrangements | Get the job done together | ⟺ | Connect, intermediate, support network formation, |
| M&E implementation & use | Focus on 'did we do what we set out to do?' (output and outcome focus) | ⟺ | Focus on 'are key actors, processes, practices, systems, structure becoming more connected?' (vision focus) |
| Funding arrangements | Linked to products/practices to be scaled (up) | ⟺ | Linked to the forging of connections and interactions |
| Nature of the scaling strategies | Blueprint | ⟺ | Organic |
| Attitude towards problems | Solving | ⟺ | Navigating |
| Collaboration | Disciplinary, intra-sectoral, involving few stakeholders | ⟺ | Inter/trans-disciplinary, inter/trans-sectoral, network/alliance, multi-stakeholder |
| Cynefin framework perspective | Simple system domain | ⟺ | Complex system domain |
| Multi-level perspective application | Single-level focus: e.g. niche dynamics | ⟺ | Multi-level focus: interplay with multiple interactive levels |
| Innovation process focus | Hardware emphasis | ⟺ | Orgware emphasis |
| Connecting to institutions and institutional change | Limited | ⟺ | Assumed need for interplay with rules of the game as core strategy |

As mentioned earlier, this is not about which approach is the best. Depending on the particularities of circumstances, one will need to decide which approach matches best with such circumstances.

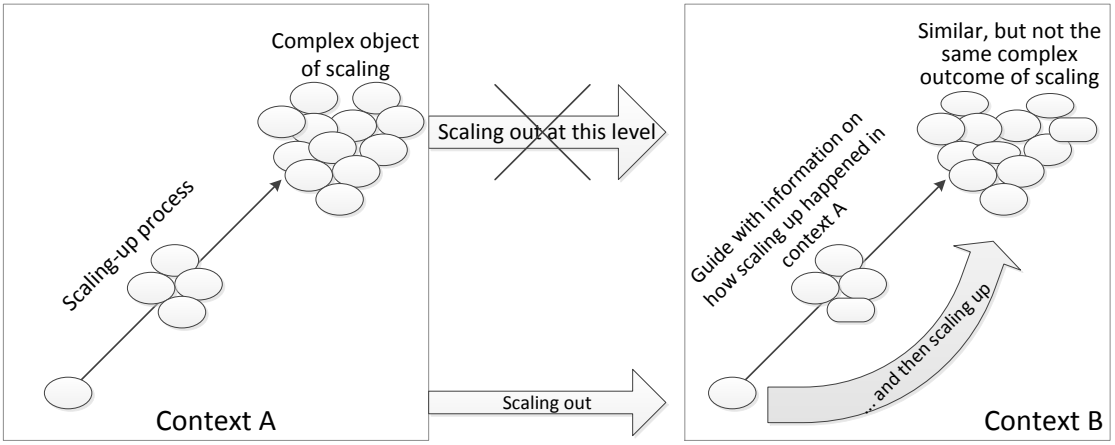
## 5.4 Developing strategies in context

The various perspectives involved in developing an appropriate approach to scaling will need to be further developed towards implementable strategies. Such strategies will need to be developed in relation to a specific situation. This means there can be a multitude of different strategies adopted. We will discuss one way of fine-tuning a strategy in the following example.

Scaling up and scaling out is different, but in many development initiatives both processes will be involved. Scaling out often requires understanding what processes of scaling up led to the formation of a system, practice or technology. It will clarify relevant associated conditions and contexts. Sometimes, rather than trying to scale out a complex system, practice, or technology, we will need to try imitate the scaling-up process that led to that complex system, practice or technology. In this way, the complex system, practice, or technology will probably become a bit different from the original, but will be a better fit in its

specific context (see figure 20). Other strategic considerations relate to the role of networking and partnerships. It will sometimes be more strategic to invest less in developing objects for scaling (e.g. new options for soil fertility management, or for pest control), and more in collaboration, networking, and alliances where institutional constraints for agricultural innovation can be addressed.

**Figure 20: Exploring options for scaling out and up**




Learn from scaling-up process in context A, scale out at a low complexity level and then guide scaling-up process towards more complexity

This is just one example of creative/strategic thinking in developing contextual strategies. It is important to further investigate such types of strategic options for engaging in scaling processes.

### *Readiness for engaging in appropriate scaling up and out*

The following overview shares a number of considerations regarding conditions or spaces for managing scaling processes. It is based on IFAD's (2009) discussion of 'spaces for scaling up', which we have adapted and elaborated on, also based on input from Gillespie, 2004.

**Box 10: Spaces for managing scaling processes**

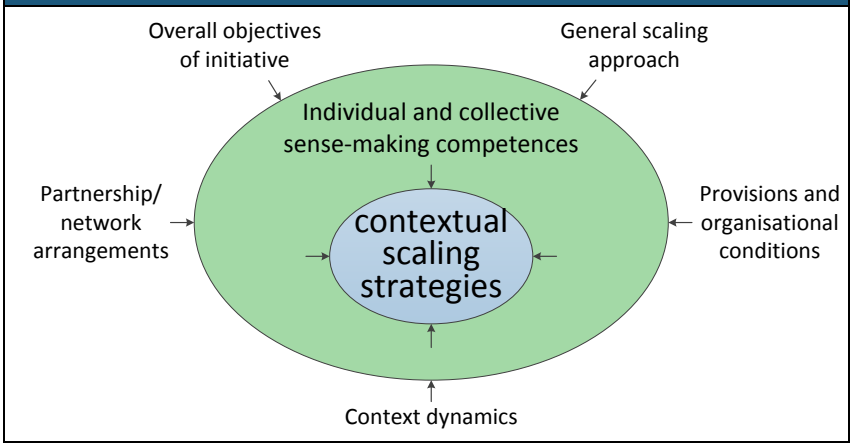
| Type of spaces | Description |
|---|---|
| Analytical space | Extent to which appropriate situation/context analysis (time, expertise) can be done, including future search, and the extent to which this can be connected to performance analysis. |
| Organizational space | Extent to which there are clear lines of responsibility, appropriate incentives (not just financial), attitudes and values related to institutional norms and practices; leadership/ direction; strategic vision, to guide scaling processes in line with defined strategies. |
| Fiscal / financial space | Extent to which fiscal and financial resources can be mobilized to support the initiative in ways which allow for contextualising scaling strategies. |
| Natural resource / environmental space | Extent to which the (cross-scale) impact of the initiative on natural resources and the environment has been considered, and whether harmful effects can be mitigated or beneficial impacts promoted. |
| Policy space | Extent to which the policy (and legal) framework allows for supporting or can be adapted to support the initiative. Includes social/political legitimacy or credibility of individuals/organization. |
| Institutional / organizational / staff capacity space | Extent to which appropriate institutional and organizational capacities can be arranged to carry the initiative forward. |

| | |
|---|---|
| Political space | Extent to which important stakeholders, both those in support and those against the initiative, can be attended to, to ensure the political support for the initiative. Includes extent to which mechanisms of representation and feedback have been addressed. |
| Communication space | Extent to which there is open communication and connectivity of all relevant actors, including the extent to which this allows for picking up weak signals on how scaling processes evolve and impact society. |
| Cultural space | Extent to which there are cultural concerns and the extent to which the initiative can be suitably adapted to connect scaling processes to culturally diverse environments. |
| Partnership space | Extent to which the initiative engages effectively with partners through alliances, networks and other forms of collaboration. |
| Learning space | Extent to which knowledge about what works and doesn't work in scaling up and out can be harnessed through monitoring and evaluation, knowledge sharing and training. |

Taking stock of all the things to be considered in engaging with scaling processes as we have discussed in this chapter, it is evident that no guidelines or standards could be developed to cover all options in strategy development. This highlights the importance individual and collective sense-making competences needed to connect strategies appropriately in relevant programme dynamics, which cannot be standardised (see figure 21).

We need conceptual insights, we need to know principles of good practice in scaling up and out, but in the end, people will need to make this work in the relevant context. In the last section of this chapter we will therefore zoom in on capabilities and competences that will help in developing appropriate strategies for scaling up and out.

**Figure 21: Configuring and reconfiguring scaling strategies in context through individual and collective sense-making competences**




## 5.5 Capabilities and competences for appropriately guiding scaling up and out

It takes many types of expertise to scale impact (Little, 2012).

In AR4D we do not work with homogenous situations. Each situation will be unique and will require making appropriate choices regarding processes of scaling up and out. Technical implementation competences will not suffice. Rather than providing a wide range of guidelines on what to do in what situation, we propose focusing on strengthening appropriate capabilities and competences. The more we can broaden the range of capabilities and competences to support our work, the better the chance that we can be make a meaningful difference in our efforts of scaling up and out in a long-term perspective. We will explore relevant competences that need to be brought to scale in order to be able to be more flexible, effective and appropriate in connecting to both active and emergent scaling processes. The areas of (individual and collective) competences we discuss are the following:

1. Use of appropriate models
2. Emergent strategy competences
3. Generative learning competences
4. Connectivity competences
5. Utilization-oriented M&E competences
6. Interdisciplinary and transdisciplinary competences
7. Strategic foresight and future search competences
8. Precautionary decision-making competences
9. Rediscovering wisdom as a core competence

### *Use appropriate models*

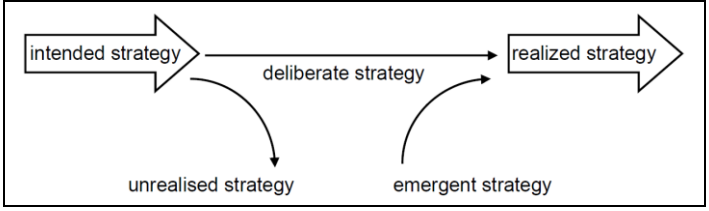
Einstein's famous "we cannot solve problems using the methods that were part of the reason for the problems", applies in relation to models that guide our strategies of scaling up and out. Sometimes, the most effective way of solving a problem, is not scaling up a solution to that problems, but by downscaling our own efforts that create the problems. E.g. diversification of crops may render the scaling of certain crop protection measures unnecessary. Some have referred to this as scaling up diversity as a strategy.

We need to connect development models across disciplines and dimensions. If scaling strategies are fed by one model, it is almost guaranteed to cause failure, ineffectiveness, or worse (see e.g. Vermeulen and Cotula (2010) who discuss this in the context of inclusive business models). E.g. we need to connect models of agricultural intensification with models of ecological integrity, with models of institutional development, with models of ethical behaviour, etc. None of those will suffice on their own to guide scaling processes. IThe above approach connects well to the approach which transition management takes in terms of incorporating a range of theoretical perspectives. Rather than focusing on just one or two aspects of societal change and intervention, it addresses multiple actors, multiple sectors, multiple levels, multiple time scales, multiple objectives and multiple options (DeWulf, et al., 2009:47). We consider such attempt to arrive at integrative and overarching vantage points as the way forward in connecting multiple scaling dynamics as well.

### *Emergent strategy competences*

As earlier discussed, scaling happens all the time and we will be positioning our initiatives within such constantly changing dynamics. Mintzberg and Waters (1985) already pointed to the fact that intended strategies as e.g. described in business or programme proposals in most cases evolve over time, which means that the implemented/ realized strategy will be different than what was originally intended. Rather than considering this to be a problem, it should be considered a sign of intelligent implementation and of an ability to respond to changes in context or in the understanding of the context.

**Figure 22: Emergent strategy (source: Mintzberg and Waters, 1985)**




Emergent strategy is not about 'find out what works and then do more of the same'. It is rather about realizing that a new situation requires ongoing adjustment of initial strategic plans. In view of societal concerns and the fact that our technological innovation abilities appear not to keep pace with the ability to understand the (long-term) impact of technologies and associated actions (Westley et al., 2011), Ison (2012) argues that this asks for increased focus on science as a reflexive practice informed by systems thinking and practice, even when the ambition is to contribute to significant and on-going innovation that can enhance wellbeing, livelihoods and food security. In the context of complexity dimensions of sustainability transition policies, Faber and Alkemade (2011) argue for policy makers to take two key issues into account: 1) Policy reorientation from

efficiency and optimization towards more comprehensive principles of system organization, and 2) Rethinking the means-end dichotomy, moving the focus of policy away from a specific aim that has to be efficiently reached to a focus of policy on a specific incentives (relating to institutional change) that will change economic patterns of development.

### *Generative learning competences*

Related to the need for working with emergent strategies, we need to learn 'forward' and not only in response to what we experience. Generative learning is a style of learning that incorporates existing knowledge with new ideas based on experimentation and open-mindedness. This style of learning encourages individual and team creativity, resulting in a new way of viewing old methods. Organizations rely on the generative learning style to adjust to changes in the market, technology and society[19]. Croom and Batchelor (1997) discuss the idea of generative learning in relation to the development of strategic capabilities. First they point to the four dimensions that help to choose an appropriate strategy:

1. Nature of the challenge presented – does it present a complex problem environment to the company, or a simple one?
2. Extent to which the learning outcome will be different from previous strategies – are we facing a radical step change or an incremental change?
3. Extent to which the "environment" is viewed as being predictable – do we know a priori how to respond to the changes?
4. Idiosyncracy of the knowledge base on which the strategy is founded – can we employ ideas and approaches used elsewhere, or do we require a dedicated and unique set of skills and knowledge?

Subsequently, they link this to the type of learning that matches those dimensions:

**Box 11: Differences between adaptive learning and generative learning**

| | **Adaptive learning** | **Generative learning** |
|---|---|---|
| **Dimensions of learning** | | |
| Processes of communication | Adopts an information processing perspective, focusing upon the range, amount and velocity of information flow through organizational structures | Focuses upon sense making and processes of organizing which shape the interpretation given to information through social interaction |
| Type of information | Emphasis upon objective data | Emphasis upon interpretive frameworks |
| Problem solving | Through single-loop learning behaviour changes in relation to static goals, norms and assumptions | Through double-loop learning goals, norms and assumptions as well as behaviour are subject to change |
| Motivation for learning | Externalization of motivation to learning, e.g. externally imposed performance criteria or adoption of generic value systems | Internalization of motivation to learning. Adopts an inside-out approach whereby the individual, group or organization are the source of development |
| **Outcomes of learning** | | |
| Complexity of the environment | Assumes that the optimization of the individual parts of a system will optimize the whole system | A systemic view recognizes that dynamic complexity caused by the interrelationships among the parts have non-linear cause-effect relationships |

[19] http://www.businessdictionary.com

| Box 11: Differences between adaptive learning and generative learning | | |
|---|---|---|
| | **Adaptive learning** | **Generative learning** |
| Degree of change | Incremental change builds upon existing knowledge, skills and experience | A breakthrough or step change is created through a new level of understanding or performance which breaks with current levels of understanding |
| Variety of responses | Utilizes negative feedback (single-loop learning) to create stability, thereby reducing the number of responses available typically in search of an optimal solution | Utilizes positive feedback (via double-loop learning) to generate a range of responses in response to high levels of ambiguity and uncertainty |
| Learning asset specificity | Learning generated has low asset specificity if it can be easily substituted due to the migratory nature of the knowledge generated | High learning asset specificity is generated when the learning or knowledge generated is dependent upon and embedded within a relational context |

### *Connectivity competences*

Connectivity competences are about forging connection in terms of knowledge, relationships and collaboration. We need to connect our ideas on scaling (up) to a context of actors and factors as we have explored in earlier chapters. This is not standard practice for most researchers. In the following we explore a few areas of need to learn to connect effectively.

Bloom and Skloot (2011) discuss the concern of governments that efforts to scale solutions to global social, environmental and governance challenges have not had the desired impact. In the chapter on 'rebooting the scale debate', Elkington, Hartigan and Litovsky argue that it is time to work on practical tools (no black box recipes though) to guide scaling processes. They argue that such search should be informed by what they call an 'ecosystems approach' (Volans, 2009) rather than from an individual enterprise perspective. They aim for systemic change and in relation to this, they consider interconnectedness, networks, alliances and collective leadership to be of essential importance.

Connecting to institutions

Institutional change processes have been identified as one of the key constraints in development initiatives. First of all, we need to understand institutions: e.g. their history and what keeps them in place. Next, we need to connect to such roots of their existence. This relates to the discussion on the multi-level perspective in 3.2. Sometimes it can be more strategic to seek entry points at the 'landscape' level than to start launching novel practices in niches (which may never fly because of institutional constraints).

Connecting in partnerships, networks and alliances

Partnerships do not form by merely connecting potential partners around a common field of work or interest. Tennyson, Hurrell and Sykes (2008) have studied global business-NGO partnerships. One of their key findings is that we tend to have rather unrealistic views about how partnerships are shaped and how they work best. Though focusing on business-NGO partnerships, many of their findings would equally apply to public-private partnerships. Similar studies have been done in relation to partnerships in agricultural research and development (Ferroni and Castle, 2011). He also found there to be many myths regarding what builds good partnerships. A key lesson to learn is that partnerships do not form nor flourish automatically. Gaps and divides between groups, sectors and cultures will need to be bridged, demand and supply on the 'knowledge market' will need to be matched and platforms and networks need to be helped to perform and be appropriately adaptive over time. This asks for systematic intermediation and brokering to sustain innovation (Klerkx, 2010).

There is a need to strengthen partnership and alliance building, or, in other words, to scale up and out partnerships and alliances with associated social capital and social skills (Horton, Prain and Thiele, 2009).

GEO (2011) highlights the role of networks in scaling processes/network approach to scaling. Learning to become effective in partnerships building and networking is critical in scaling (up) strategies and associated competences. Partnership development and maintenance requires appropriate skills, attitude and behaviour. E.g. 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, etc.) What is the purpose of the partnership and what does this mean for interaction (Tennyson, 2005).

Forging connections - intermediation

Recently, various authors (e.g. Howells, 2006; Klerkx, 2010; Klerkx and Leeuwis, 2009; Katzy et al., 2013) have looked at the role of innovation intermediaries in collaborative innovation processes. They refer to actors who play facilitating roles in the process of making/helping/letting innovation happen. This may refer to creating spaces for exchange, connecting different (policy or decision making) levels, networking among innovation actors and other forms of support to innovation processes. They may often play more of a catalyst role in getting innovation processes going or in a higher gear. Such brokering can be seen as a particular strategy for scaling innovation. Knowledge institutes are often among the ones being in a good position to play such role (e.g. see Wigboldus and van der Lee, 2011).

Developing team-role perspectives on collaborative efforts

Given the many dimensions of capabilities involved in responsible research and innovation, AR4D and various possible approaches to scaling (up) it is helpful to adopt a team role perspective to innovation such as the Belbin team roles (http://www.belbin.com/) to which we referred earlier. Sniukas (2007) and Kelly (2005) have adopted a similar approach to the context of innovation, describing ten roles to play in innovation processes:

**Box 12: Interactive roles to play in innovation processes (Source: The Ten Faces of Innovation, Sniukas, 2007 based on Kelly, 2005)**

| Personas | Roles | Description |
|---|---|---|
| **The Learning Personas** Constantly gather information from new sources, keep the team from becoming too internally focused, question their own worldview. | Anthropologist | Brings new learning and insights by observing human behavior and developing a deep understanding of how people interact physically and emotionally with products, services, and spaces. |
| | Experimenter | Prototypes new ideas continuously, learning by a process of enlightened trial and error. |
| | Cross-Pollinator | Explores other industries and cultures, then translates those findings and revelations to fit the unique needs of the company. |
| **The Organizing Personas** Savvy about the counterintuitive process of how organizations move ideas forward. | Hurdler | Knows the path to innovations is strewn with obstacles and develops a knack for overcoming those roadblocks. |
| | Collaborator | Helps bring eclectic groups together, and often leads the middle of the pack to create new combinations and multidisciplinary solutions. |
| | Director | Gathers a talented cast and crew, helps to spark their creative talents. |
| **The Building Personas** Apply insights from the learning roles and channel the empowerment from the organizing personas to make innovation happen. | Experience Architect | Designs compelling experiences to connect at a deeper level with customers' latent or expressed needs. |
| | Set Designer | Creates a stage on which innovation team members can do their best work, transforming physical environments into powerful tools to influence behavior and attitude. |
| | Caregiver | Builds on the metaphor of a health care professional to deliver customer care in a manner that goes beyond mere service. |
| | Storyteller | Builds both internal morale and external awareness through compelling narratives that communicate a fundamental human value or reinforce a specific cultural trait. |

### *Dynamic monitoring and evaluation and impact evaluation competences*

The field of monitoring and evaluation (M&E) and impact evaluation (IE) has come into the spotlight more over the past decade in international development practice. There is a tendency for it to be treated as either a compliance mechanism, providing data/information for external reporting requirements, or to the other extreme of becoming a goal in itself. Scaling (up) in process asks for utilization-focused M&E[20] (see e.g. Patton, 2008, 2009) where M&E primarily serves the purpose of informing management decision making and by doing so providing strategic guidance on an on-going basis (see e.g. Patton, 2010). Impact evaluation can play an important role in understanding (assumed) causal relationships. Demonstrating that interventions cause development effects depends on theories and rules of causal inference that can support causal claims (Stern et al., 2012). A reality that often has to be faced in IE is that there is a trade-off between the scope of a programme and strength of causal inference. It is easier to make strong causal claims for narrowly defined interventions and more difficult to do so for broadly defined programmes. When impact evaluation becomes a mere compliance mechanism, its primary utility is lost.

Developmental evaluation is an approach to (monitoring) and evaluation which applies complexity concepts to enhance innovation and support evaluation utilization (Patton,2010). Two key questions regarding the way in which we want to work with M&E in the context of emerging change processes (which includes processes of scaling (up), are (1) what role do we want to give to M&E and (2) what role can M&E play given the nature of its dealings with interventions and change processes?

Developmental evaluation is closely related to reflexive monitoring. "It is a form of monitoring that focuses on action. The monitoring activity is in fact not a separate activity itself, but is instead more an integral part of the process. Additionally, the insights gained from the monitoring are tried and experimented within the project's new activities. This allows [reflexive monitoring] to help participants keep their ambitions set high (in terms of sustainable development and system innovation). This lets it contribute to coherent, structural change without the route and destination necessarily being mapped out precisely beforehand (Mierlo, 2010: 11).

There is no lack of methods and methodologies for M&E and IE[21]. Designs need to build on causal inference approaches each of which have their strengths and weaknesses, one of the reasons that combining designs and methods – so called 'mixed methods' – are valuable (Stern et al., 2012). A core competence in relation to M&E and IE is therefore the ability to make appropriate choices as to what methods and methodology would make the evaluation most useful. A notable additional method which is not commonly used relates to picking up weak signals (a kind of social early warning signals) which allows for swifter management responses[22].

### *Interdisciplinary, transdisciplinary, and integrative competences*

First of all we need to clarify that interdisciplinary and transdisciplinary competences can only flourish if good disciplinary competences exist as well. We focus on the first two competences since it remains one of the frontiers for scientists and researchers. Multi-disciplinarity relates to the ability to combine disciplinary perspectives and models, interdisciplinarity relates to the ability to integrate disciplinary perspectives and models, while transdisciplinarity relates to the ability to take a meta theory and meta method perspective, converging science and society perspectives. In fact, transdisciplinarity may also be viewed as relating to an underlying common reality, which is zoomed in on through disciplinary work (Wigboldus, 1991). Though still limited, the idea and practice of transdisciplinarity tends to be more explored in other sectors than agriculture, e.g in health sector (see Haire-Joshu and McBride, eds., 2013

[20] A premise of this approach is that evaluations are to be judged by their utility and actual use in the first place, and not by the alleged quality of methodology (which can only be determined after clarifying how the evaluation can be made useful.
[21] See e.g. Tools and Resources for Assessing Social Impact (TRASI) database at http://trasi.foundationcenter.org/
[22] E.g. work by Dave Snowden on Sensemaker http://www.sensemaker-suite.com/smsite/index.gsp

on transdisciplinary public health). The idea of 'sustainability learning' or 'learning for sustainability', often tends to take a transdisciplinary approach (see e.g. Wals and Corocran, editors (2012), and Brown, Harris and Russell, 2010).

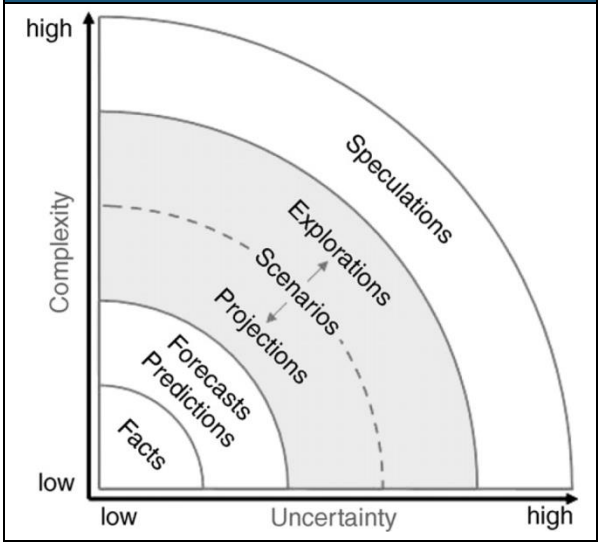
It is an attempt to connect practice-oriented skills and abilities with capabilities that relate closer to what ultimately motivates people's thinking and action. It also relates to the capability to engage in the ethical dimensions of e.g. responsible research and innovation. By doing so, it highlights the need for connecting social capabilities to technical capabilities. Along these lines Fagerberg and Srholec (2008) discuss the importance of the spread of values, beliefs and institutions that encourage members of society to actively contribute to the development process. Social capabilities are often strongly influenced by historical factors (e.g. geographical, demography, development history). On the negative side, the lack of formation of such social capabilities may play a role in institutional constraints encountered.

### *Strategic foresight and future search competences*

Scaling up our out sets processes in motion the impact of which we often do not completely foresee. Situation analysis in relation to agricultural development often spends little time exploring anticipated future dynamics. Foresight is the capacity to think systematically about the future to inform today's decision making. Futures are about the research, methods, and tools that help develop a foresight capacity. As example, many foresight reports have been written over the past decade, many of which work with a time horizon up till 2050 and beyond (e.g. Foresight (2011) on the future of food and farming, Chaumet, et al. (2010) on scenarios and challenges for feeding the world in 2050, Vaes and Huyse (2012) on development cooperation in 2020, Nelson, et al (2010) on food security, farming and climate change to 2050, and Barakatt, et al, editors (2010) on Africa in 2060). This involves understanding of trends as well as imagination.

A trend is a kind of scaling process which we may detect. Scaling (up) strategies need to connect to such trends. A technology may respond to one trend, but not another. For this purpose, models and associated simulations are developed so that we can develop an appreciation of possible trends that we will need to respond to. These simulation models are used to predict e.g. effects of policies and are based on assumed scaling or power laws (e.g. Katz, 2006). This is critical for policy making as well as in strategy development, but they often involve a number of assumptions relating to a particular understanding about mechanisms (groups of interactive causal relationships). Only the future will tell whether the model is picking up the right signals The question is whether we can also develop simulation models in relation to socio-technical or socio-ecological processes.

**Figure 23: Working with different instruments and processes in line with the nature of aspects of reality (source: Zurek and Henrichs, 2007).**




### *Precautionary decision-making competences*

"There is growing evidence that precautionary measures do not stifle innovation, but instead can encourage it, in particular when supported by smart regulation or well-designed tax changes. Not only has the body of knowledge become richer since 2001, but also the number of stakeholders involved in decision-making has become larger and more diverse. There has also been increasing attention to communicating scientific uncertainty, especially in the fields of climate change, food safety, and emerging risks (Grandjean, 2013:639 on precautionary science).

"Science does not provide a prescription for the right decisions on environmental hazards. The emphasis on research will be different for those whose first priority is scientific exactitude and those who focus on making policy in the context of environmental protection and public health. When a precautionary perspective mandates action to prevent foreseeable harms, the evidence does not have to meet the most rigorous demands of science. However, world views, political and other preferences, technical and economic feasibility, and alternative options are crucial for decision-making". (:640)

We close this section with an overview of various consideration involved in responding to incomplete understanding of causation from a precautionary principle perspective ( adapted from Gee, 2013:656):

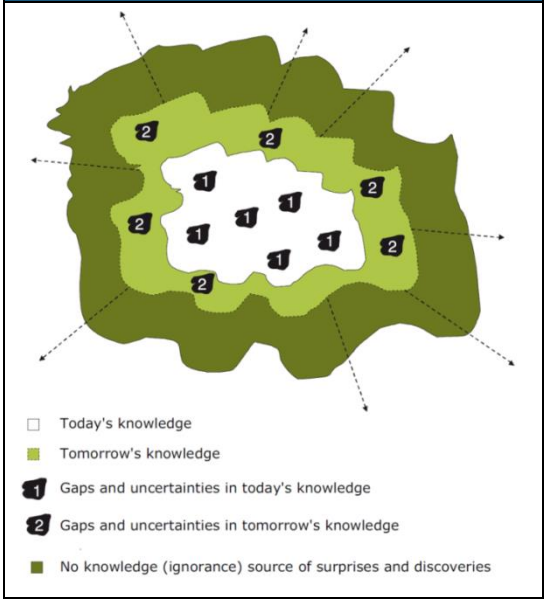
**Box 13: Towards precautionary decision-making**

| Situation | Nature of knowledge | Type of action taken |
|---|---|---|
| Risk | '**Known' impacts** and **'known' probabilities** | **Prevention**: action to reduce known hazards |
| Uncertainty | **'Likely impacts** but **'unknown' probabilities** | **Precaution**: action taken to reduce exposure to plausible hazards |
| Ignorance | **'Unknown' impacts** and therefore **'unknown' probabilities** | **Precaution**: action taken to anticipate, identify earlier, and reduce the extent and impact of 'surprises' |
| Ambiguity | Concerning the different **values and interpretations** about information used by stakeholders | **Participatory precaution**: stakeholder engagement in decision-making about innovations and their potential hazards |
| Variability | The natural differences in population or ecosystem exposures and sensitivities to harmful agents | **Obtain more information** in order to minimise simplistic assumptions about average exposures and sensitivities |
| Indeterminacy | Unpredictable uses of technologies | **Pre-market benefit assessment** of novel uses of a technology with potential hazards |

### *Rediscovering wisdom as a core competence*

Last but not least, we raise the subject of wisdom. Each year, about 4 times as many books are published on knowledge than on wisdom (based on Google n-gram). Wisdom is about knowing what is right, timely and appropriate to do under specific circumstances. Wisdom is a finely balanced, difficult, and uncertain thing in itself. We may need to deal with difficult and uncertain aspects of life by relaxing our modern urges to resort to rationality and to seek to control. In other words, paradoxically, we might be more in control if we are prepared to accept less of it (see McKenna, Rooney, and Boal (2009) on wisdom principles as a meta-theoretical basis for evaluating leadership). Responsible scaling up and out necessitates activating other-than-technical knowledge and roles and also involving others than technical experts in seeking ways forward. But it includes maintaining a healthy modesty about how we engage with scaling processes, stemming from a realization that what we know today may be found to be incorrect or irrelevant tomorrow.

**Figure 24: Expanding knowledge -- continuing uncertainties (source: Gee, 2013)**

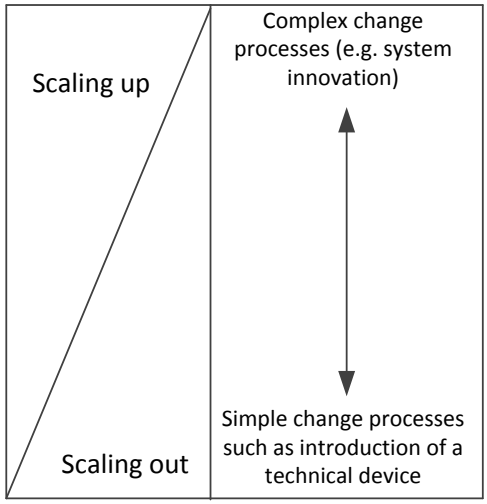


# 6 Conclusions

The concept and idea of scaling up and out as used in the context of international development, has been interpreted and applied in various way. Sometimes it is merely part of a rhetoric where the term 'scaling up' is used to draw attention to the need for increased effort to tackle particular problems and challenges. We found that scaling processes come in many types and involves many different processes. It is helpful to unpack any scaling ambitions in relation to such variety of potential manifestations of scaling processes in order to better understand implications for design, strategic guidance and needed capacities. Furthermore, though concrete strategies will need to be defined in context, there appear to be a variety of principles that help to establish good practice in scaling up and out. On the basis of the exploration, we share a couple of tentative conclusions and recommendations on this in the following:

- Most writing and speaking on scaling up relates to multiplication in terms of 'more of the same' in which case we would argue that scaling out is a more appropriate term. We would advise to reserve the term 'scaling up' to processes in which value is added to something rather than referring to mere multiplication of the same. This helps to clearly distinguish scaling up from scaling out. At the same time, we will see in practice that processes of scaling up and scaling out are often connected. Only scaling up or only scaling out will rarely happen (see figure 25).

**Figure 25: Scaling up and out are often interacting processes: the more complex the situation the more scaling up will be involved, the simpler the situation the more scaling out will be involved.**




- The statement 'find out what works and then do more of the same' will in many cases prove to be an ecological fallacy (what works at one scale will work at another), and/or a composition fallacy (what is good for one person is good for everyone). The idea of experimenting first in order to 'find out what works' and then to scale out the same, also overlooks the very reason for why experimentation was done in the first place: to find out what works in a particular situation given particular circumstances.

- Scaling is a continuously occurring fact of life. We have desirable scaling processes and undesirable scaling processes amidst which we position our development initiatives. There are downscaling child mortality rates, scaling real income levels, scaling access to health and education services, scaling access to technological inventions, and so on and so forth. At the same time, there are scaling populations, scaling pests and diseases, scaling pollution, scaling degradation of the environment, scaling CO2-emissions, scaling water levels, scaling sweet water shortages, and so on and so forth. We need to be aware that there are causal connection between some of our scaling desires and some of the undesirable scaling processes. We need to therefore work on our capability to position wise action within the interplay between these different types of scaling processes.

- Engaging with scaling processes starts from day one of any programme. Seeing scaling processes as a stage in a programme (e.g. in year 3) is a misconception of what scaling is all about and how

it is part of everyday life. There are, however, stages in scaling processes, but that is something different.

- There are often more possible complications involved in scaling processes than we tend to initially anticipate. This asks for careful consideration of what approach would be appropriate and in all cases requires careful analysis (past-present-future) concerning how an initiative would connect to on-going and anticipated scaling processes many of which cannot be controlled through the initiative.

- Scaling of technologies appears to attract the focus of development planners, while scaling of conditions for change, such as institutional arrangements, will often prove to be a more strategic investment. It will, however, require different capabilities to connect to institutional change. Such capabilities often not being available, there is a tendency to limit ourselves to efforts in relation to technologies.

- Given the challenges involved in strategic guidance of engaging with scaling processes, investing in appropriate individual and collective capabilities, which are often different than 'capabilities as usual', will strengthen readiness for responsible scaling up and out in agricultural development. Researchers are often ill-equipped to guide such processes. Scaling up and out such capabilities for scaling can be seen as part of an overall scaling approach.

- Ideas on scaling up and out often relate to ideas on progress and development and associated paradigms and worldviews. For that reason, approaches and strategies in terms of scaling up and out may be contested. We need to develop ways of working with different rationalities regarding what good or bad we expect to come out of scaling processes. It requires appropriate governance of complex scaling initiatives.

- The multi-level perspective, particularly if enriched with complementary conceptualisations, is a helpful model for envisioning scaling processes and distil options for scaling strategies.

As this has been an exploratory study and we would advise further development and fine-tuning of suggestions shared in this document. This could be input into defining policy and strategy implications and options for the Humidtropics programme. The word 'options' is key in this. This is not about mainstreaming one particular approach to scaling up and out, but offering components or modules that can be tailored to the specifics of a situation. It will also be important to document case studies of how various types of approaches to scaling up and out are being translated to specific strategies within Humidtropics' experience over the coming years. This would not so much be for developing standards, but most of all to provide sources of inspiration of how to think and act strategically in scaling up and out.

In the end, we believe that readiness for responsible scaling up and out will relate most of all to individual and team capabilities and competences, and not to standards. Investing in strengthening such capabilities and competences will therefore be crucial. This includes investing in negotiations with donors and other key stakeholders to create appropriate conditions that match with conditions for responsible scaling up and out.

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# Appendix 1 – Good advice from peers

The following are excerpts from a range of authors who describe their study of the concept and/or practice of scaling (up).

From: Middleton, Tabitha et al. (2002). Lessons learnt on scaling up from case studies in Bolivia, Nepal and Uganda. IDG/DFID.). A suggested checklist for strategic planning of scaling up processes (adapted):

- Do not limit understanding to the horizontal dimension of scaling up (technology transfer, dissemination), also consider vertical scaling up issues.
- Look at institutional roles to be played in the scaling up process and possible capacity building that it would need to involve
- Accountability in the process needs to be defined appropriately and needs to involve accountability to those who are meant to benefit as well
- Time frames need to be appropriate in view of the anticipated scaling up process
- Funding needs to be secured for the appropriate time-span 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 up process may unfold.
- Not all can be planned for. Build in flexibility and sense-making processes for adaptive management of the scaling up process.
- Collaboration, networking and strategic alliances increase impact and sustainability.
- Consider which capacities will need to be in place to make the scaling up process successful and include a capacity-building in the strategy as appropriate.
- Participatory processes (e.g. planning with farmers and communities) will often be crucial to the success of the scaling up process.
- Consider what will be involved in making the scaling up process sustainable, but also consider what scaling up may mean in terms of (e.g.) environmental sustainability (such as carrying capacity issues).
- Build in sound monitoring and evaluation (M&E) processes for the purpose of strategic guidance, effective implementation and engaging stakeholders in sense-making (incl. accountability processes).

From: Pachico, Douglas and Sam Fujisaka, editors (2004). Scaling up and out: Achieving widespread impact through agricultural research. International Centre for Tropical Agriculture (CIAT). Summary advice:

- Vision of scaling up to be integral part of programme planning
- Ownership and involving key stakeholders is key
- Need for adopting a multi-level approach
- Need for substantiating the results achieved by pilot projects and programmes
- Communication and networking is key
- A generous time-scale and budget is appropriate

Already in 1999 CGIAR workshop on scaling up sustainable agriculture initiatives. IIRR (1999). Approaches and issues for successful scaling-up that were shared included:

- Develop coalitions (coalition implies flexibility)
- Expand capacity in participatory approaches
- Expose researchers and policy makers to farmer experimentation (on-the-ground realities)
- Build capacity on an on-going basis and at all levels (learning through experience and reflection)
- Develop both individual and institutional linkages
- Sustain farmer research networks

- Engage with farmers to clarify visions of sustainable agriculture and to experiment
- Enable knowledge sharing between all levels
- Connect to local availability of inputs
- Systematize experiences on an on-going basis (tools for discovery and dissemination)

### *Ideas from CIAT*

Menter et al. (2004):

- Incorporate scaling-up considerations into project planning
- Approach capacity building as a scaling up process in itself
- Making information and learning shared
- Building linkages
- Engage in policy dialogues
- Sustain scaling processes

### *Ideas from IFAD (2004)*

IFAD's experience in scaling up IFAD's experience with decentralized and participatory rural development and poverty reduction in Viet Nam. This led to the identification of the following success factors:

- Political will (to adopt and sustain commitment to economic reforms)
- External catalysts as drivers
- Continued policy dialogue (among donors)
- Dynamic and evolving process (no blueprint)
- Use of previous learning (including practicalities involved) in scaling up processes

### *Ideas from IFPRI*

Gillespie (2004) (in the context of community-driven development) defined the following (selected) success factors:

- Political and financial commitment by political leaders
- Community cohesiveness
- Harmony and responsiveness of institutional arrangements to evolving context
- Working with government and other structures (no by-passing)
- Interdonor coordination
- Well-defined stakeholder incentives, roles and responsibilities
- Committed leaders and facilitators
- Capacity to participate and demand

The concept of scaling (commonly phrased as ‘scaling up’) features prominently in international development proposals and plans. It sometimes conveys the idea of a kind of finishing touch to development initiatives, which will multiply their effects. If so, that may be the answer to our concerns in relation to sustainable development goals. This paper basically says: not so fast; we first need to understand well what scaling up and out is about and how it can be carried out responsibly. Responsible scaling up and out is not just about technical feasibility, but also relates to different ideas on progress and development. This translates to different types of approaches to scaling up and out, which have been described in this paper as: push, pull, plant, or probe. Specific strategies for scaling up and out within such approach perspectives, will need to be tailor-made in relation to context specifics. For this, we do not in the first place need standards and guidelines, but individual and collective competences as well as conducive spaces for appropriate strategy development and implementation. We discuss a number of such competences.

**More information: www.wageningenUR.nl/cdi**

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