

Adaptive scaling to achieve system transformation in One CGIAR

The food system is defined as a network of actors, their institutions and activities related to the production, value addition and consumption of food. It is a complex system that operates across scales (i.e., from farm to local, national, regional and global), time, and institutional and regulatory frameworks (Hall and Dijkman 2019). Therefore, the system is influenced by a set of practices, relationships, values and rules and their interconnections that form the underlying structures and supporting mechanisms. System transformation, therefore, refers to bringing about lasting change by altering the underlying structures and supporting

mechanisms (Abercrombie et al. 2015), and perpetuating this change so that it becomes the 'new normal' (Woltering et al. 2019). Triggering system transformation requires multi-actor and stakeholder engagement and partnership in the scaling ecosystem to realize win-win collaboration, collective action, interactive learning and capacity development (Minh et al. 2020). Stimulating system transformation requires identifying the socio-technical innovation bundles that fit, designing and implementing effective scaling strategies, and fostering multi-actor engagement and partnership to achieve impact and trigger change across scales.



Vegetable farmers selling their produce in Siraha district, Nepal (photo: Nabin Baral/IWMI).

Challenges of innovation scaling for system transformation

The term ‘scaling’ is gaining momentum, and scaling approaches such as Stage Gate, Scaling Scan (Jacobs et al. 2018) and Scaling Readiness (Sartas et al. 2020) are useful for assessing whether an innovation is ‘ready for scaling’ and identifying the supportive functions that are needed to achieve scaling. The use of a specific approach or a bundle of approaches will depend on the objective of the actors involved in scaling efforts. For example, the Scaling Scan approach can be used to evaluate, manage and report on the scalability of an innovation or supporting processes and actors to achieve successful scaling.

According to these approaches, ‘success’ is achieved when a specific innovation is adopted and used by a large number of people. This overlooks a key insight that has emerged from recent literature on innovation scaling and what scaling really means. Simply saturating the market with a new seed variety, solar pumps or advisory services, for example, is not going to result in a systemic change leading to significant increases in agricultural productivity, greenhouse gas reductions or food security unless other conditions are also in place. This would require the system to have transformed to the extent that it supports access to new information, products or services, triggered new investments and translated these into wider impacts on nutrition and food security, climate adaptation, environmental health, and gender equality and social inclusion.

Therefore, we must shift our focus toward addressing systemic barriers and treat scaling as a *systemic change process*

(ISPC 2015) needed to achieve the transformations required to meet the United Nations Sustainable Development Goals (SDGs). This means that along with bundling technology and social and institutional innovations, we need to acknowledge that scaling processes are complex and dynamic. Therefore, scaling for system transformation requires the co-evolution of organizational and institutional arrangements as part of a long-term supporting process (Woltering et al. 2019) and simultaneous pervasive systemic change to enable and spread the innovations (ISPC 2015). In this technical brief, we draw on the growing academic literature on scaling (e.g., Cooley and Linn 2014; Wigboldus et al. 2016; Frake and Messina 2018; Sartas et al. 2020) as well as more practical guides to scaling agricultural innovations (e.g., IDIA 2017; Kohl and Foy 2018; Jacobs et al. 2018). We also reflect on lessons learned from operationalizing adaptive scaling in various action-oriented research-for-development programs.

Defining food innovation scaling systems

Scaling food innovations is embedded in complex socioeconomic, ecological and political contexts consisting of multiple subsystems. These subsystems include, for example, the characteristics of farming systems themselves, the policy and institutional environment, the existence (or lack) of effective agricultural value chains (both input markets, e.g., making technologies available, and output markets for the resulting products), availability of reasonably priced capital for investment and equal access to resources (e.g., information, water, land and seeds, as illustrated in Figure 1).

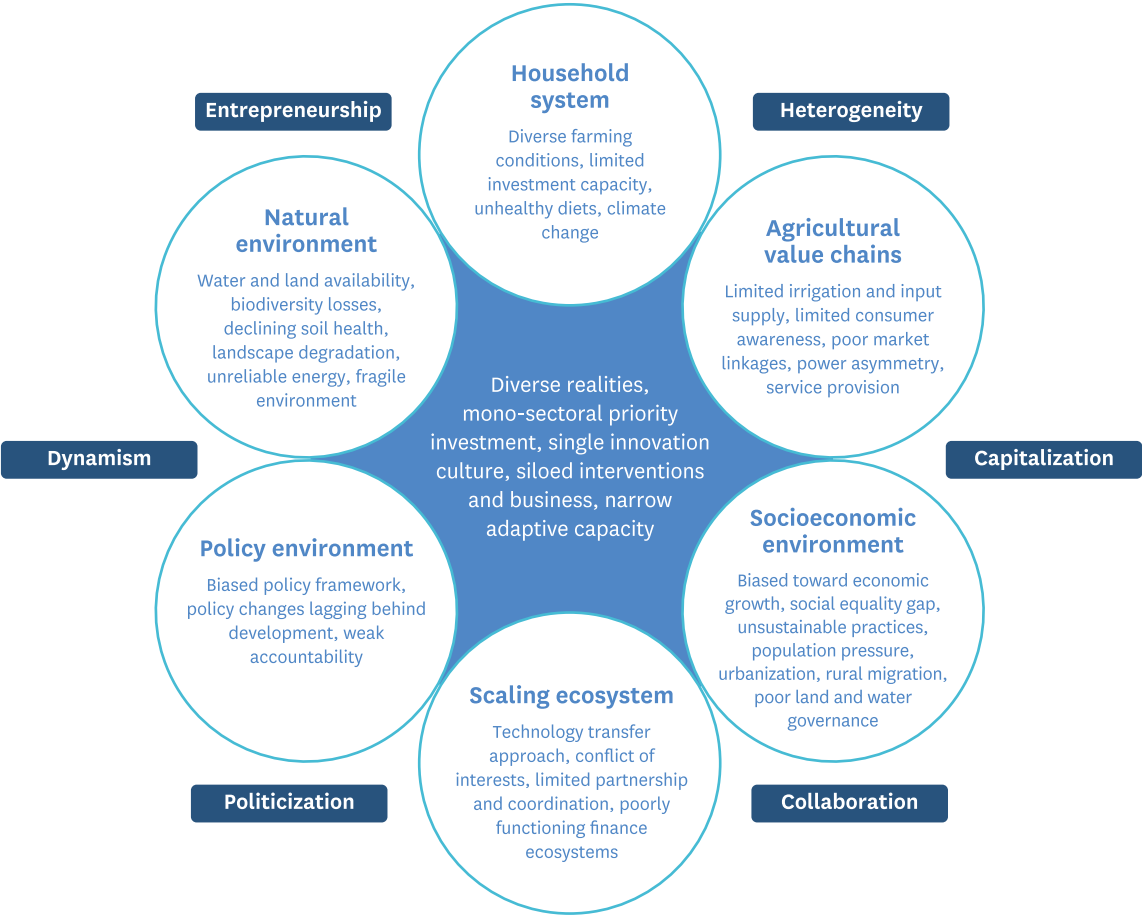


Figure 1. Scaling system: context and barriers.

Some of the literature on scaling draws on innovation systems theory. This stresses that the key to innovative processes lies in the flow of technology and information between people and institutions. It also emphasizes the need for systemic interactions among actors and stakeholders to take a new idea or technology to scale. This is often achieved through ‘innovation platforms’ (sometimes referred to as ‘hubs’ or ‘clusters’), i.e., facilitated forums that bring together the full range of key stakeholders to learn, negotiate and coordinate efforts to make new technologies or knowledge widely available. These are now common features of research-for-development programs (e.g., Dror et al. 2016; Schut et al. 2019; van Rooyen et al. 2017). A recent paper on innovation ecosystems (Pigford et al. 2018) broadens the innovation system concept by drawing on experiences in businesses to focus more on value creation. In addition, it recognizes that food innovation scaling systems are embedded in and linked to a wider set of innovation systems. The purpose remains the same, however: either to enhance or create enabling environments and foster innovation communities. Another recent paper highlights the need for a mission or ‘vision’ to drive food system transformation (Klerkx and Begemann 2020).

What is adaptive scaling for system transformation?

We define adaptive scaling as ‘processes by which diverse actors and actants cooperate, feed off, adapt to, support,

compete and interact with each other, forming different multi-actor networks and corresponding collective actions to undertake various functions in the scaling ecosystem’ (Minh and Schmitter In review). We identify four interconnected functions for adaptive scaling: niche, reach, accelerate and transform. These are processes that are guided by reflective, adaptive, inclusive, responsive and accelerative principles, as outlined below.

1. *Reflective*, i.e., reflects, manages and responds to dynamic and changing circumstances throughout the scaling processes.
2. *Adaptive*, i.e., adjusts and adapts the scope, capacity, and responses to and management of the strategy to the evolving dynamics of new system properties throughout the scaling processes.
3. *Inclusive* in scope, process and effort and in terms of who is involved and who benefits, which may involve harmonizing different interests and benefits.
4. *Responsive* to systemic barriers, enabling factors, societal needs, and societal and environmental concerns, and anticipates ‘what if this goes to scale?’
5. *Accelerative*, i.e., reaches scale by addressing gaps in knowledge, policy, and institutional or financial capacity.

These principles provide feedback loops between the various scaling functions. Figure 2 illustrates the adaptive scaling functions and guiding principles supporting the scaling processes.

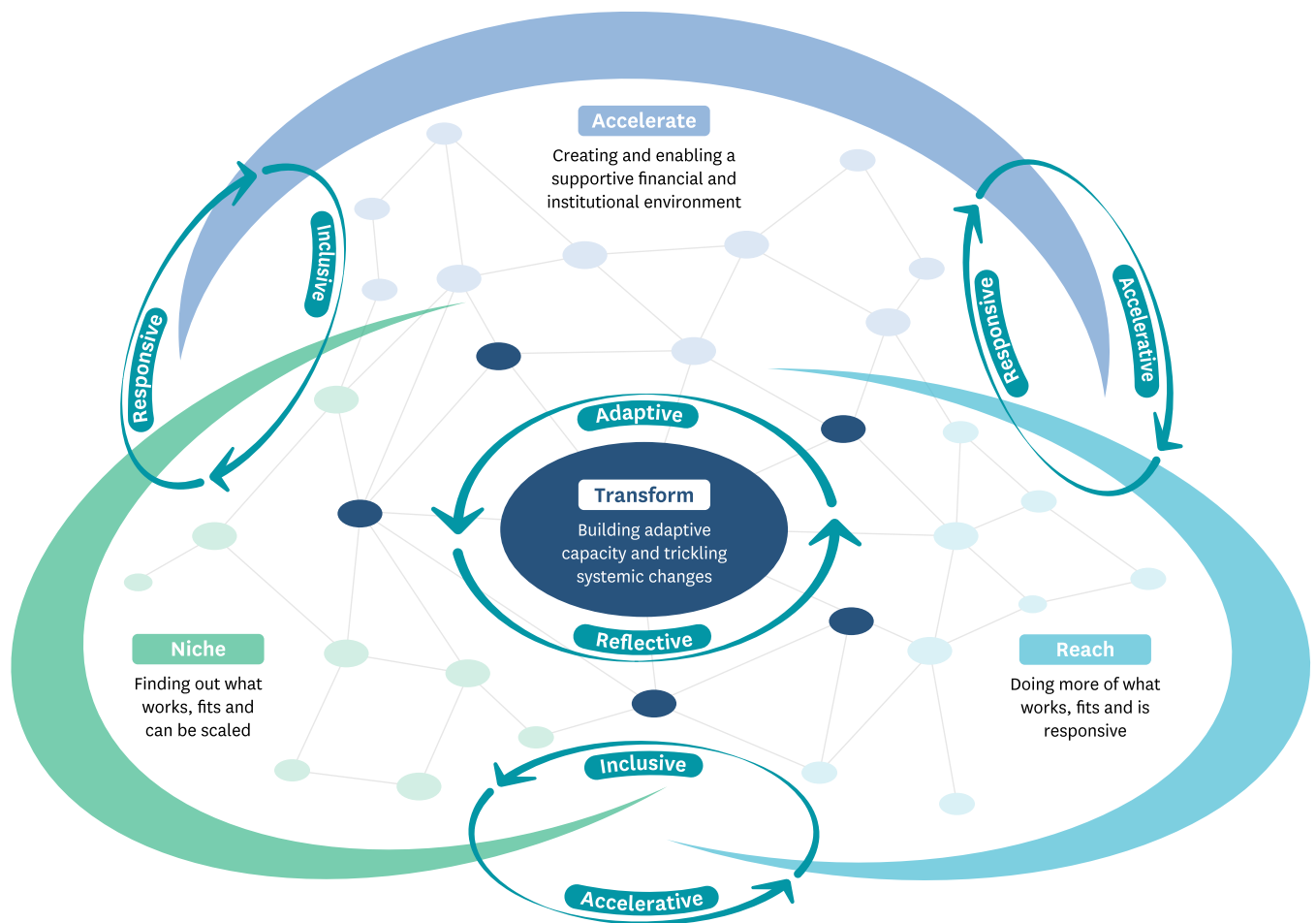


Figure 2. Adaptive scaling for system transformation: ecosystem and principles.

Source: Minh and Schmitter In review.



Farmers growing vegetables using drip irrigation in Kathmandu, Nepal (photo: Sharad Maharjan/IWMI).

Niche allows actors to find out what works, fits and can be scaled. Here, actors develop and pilot a combination or bundle of innovations and actions to support the scaling. These scaling bundles can be technical, social and/or institutional in nature and can include new seed varieties, irrigation technologies, agronomic practices and extension services, end-user financing, input and output market services, agro-processing and postharvest techniques. One example is testing a pay-as-you-go service for water-lifting technologies in a specific location to support irrigated vegetable value chains. Another example is bundling drought-resistant seed varieties with crop insurance. Key in this scenario is the private sector, which includes farmers as entrepreneurs, value chain actors, irrigation companies and agribusinesses as well as end-user financing providers. Activities are often funded through government- and donor-supported research-for-development projects or development agencies, whereby *governments, research institutes, the private sector and civil society work together* to catalyze and develop scaling bundles and accelerate their impacts at scale.

Reach involves doing more of what works, fits and is responsive to the contextual needs. This means that more actor networks are involved compared to the niche stage, at an increasing speed and beyond the duration of the project/program/business initiative. At this stage, multi-actor networks come together to create win-win collaboration and business opportunities and economic profit at scale. Examples include a financial institution or bank partnering with a mobile platform to process payments for specific agribusinesses, enabling them to reach different market segments at district, regional or national level. Additional actors could be incubators who aim to support startups and small and medium-sized enterprises (SMEs) in expanding their services or geographic reach. Different actors fulfilling different roles are needed to stimulate business investments in new areas, such as public sector investment to de-risk business ventures in bottom-

of-the-pyramid markets. The role of research institutions here is to fill knowledge gaps in the private and public sectors, thereby helping innovations to reach scale by, for example, identifying new market segments and gender gaps in credit financing, and developing water and environmental risk monitoring, or trade-off tools.

Accelerate refers to creating and enabling a supportive financial and institutional environment to reach scale in a sustainable and inclusive manner. Scale accelerators for socio-technical innovation bundles include policy makers, financiers, research institutions and technical specialists who support scaling through policies, accessible finance, knowledge and human resources. Policy changes could be related to the removal of import taxes on agricultural, irrigation and renewable energy equipment. Other examples are development funds to de-risk private sector initiatives, accelerator grants or impact investors that help startups or SMEs to take their agribusiness to the next level. Research institutions are crucial scale accelerators too, as they build capacity within institutions and facilitate dialogue and collaboration between various stakeholders across sectors and their respective networks.

Transform refers to the change that occurs when there is sufficient progress in the other three functions (niche, reach and accelerate) to respond to the dynamism of the scaling processes. It requires strong institutional capacity, win-win partnerships and well-functioning markets that allow for the adaptation of innovation bundles and scaling processes. Market facilitators and intermediaries link the organizations and actors within a scaling ecosystem. They transfer ideas, technologies, investments and other resources, helping to commercialize socio-technical innovations and/or innovation bundles at scale. An example is a multi-stakeholder platform that provides a physical and institutional space for stakeholders to identify win-win collaboration, undertake

collective action and engage in interactive learning that supports all the functions in the scaling ecosystem in a sustainable manner. Activities can also include innovation research grants and private sector internships aimed at stimulating agile innovations by reducing the research-private sector knowledge divide and building the next generation of young professionals by supporting job readiness.

The effectiveness of each of the four functions is a product of the success of the others: they are interlinked in many ways, impacting each other through feedback mechanisms. Some scaling ecosystems are already effective, enabling a fairly rapid scaling process. However, in many developing countries, scaling ecosystems are not very effective, or may have some components that are relatively strong (e.g., research institutions) but others that are less conducive (e.g., a lack of access to affordable finance). However, even weak scaling ecosystems have bright spots, such as actors committed to reform. It is important to identify them and support their efforts to create a more effective system.

Adaptive scaling demands integration of these principles and their embeddedness in the functions in the scaling ecosystem. Scaling principles and functions, therefore, do not float freely but must be integrated into a scaling ecosystem with reinforcement loops. Understanding adaptive scaling as processes of systemic change provides a lens through which to explore different scaling strategies such as innovation partnerships, multi-stakeholder engagement, win-win business opportunities, and interactive learning and collaboration (ISPC 2015; Minh et al. 2020). These strategies help to enable various impact pathways in, for example, sustainable and inclusive water resources management for resilient food systems: dialogue, policy framing, joint action and consensus building (Smith and Cartin 2011). Moving from action to impact, the strategies help to ensure that water solutions, for instance, are socially inclusive and transform food systems under climate change, when evidence is synthesized, influencing policy and practice changes at increased scale (IWMI 2019). Scaling strategies may be driven by the private sector (commercialization), public sector, nongovernmental organizations (NGOs) or civil society organizations, or some combination thereof. The type of scaling strategies will be based on the priorities of actors, stakeholders and researchers in action-oriented research-for-development programs to achieve one or several of the five impact areas targeted under a unified One CGIAR:

- Nutrition, health and food security
- Poverty reduction, livelihoods and jobs
- Gender equality, youth and social inclusion
- Climate adaptation and mitigation
- Environmental health and biodiversity

For example, NGOs may place greater emphasis on achieving gender equality and social inclusion while private irrigation technology firms may emphasize business development. These are not mutually exclusive: we are aware of NGOs who promote inclusive businesses for women and youth. Policy makers, too, are likely to have multiple objectives. The adaptive scaling approach requires all relevant actors to take on the core roles aligned with their institutional mandate and priorities. Therefore, scaling is not driven by scaling practitioners or managers but by the actors and stakeholders themselves.

Implementation of the adaptive scaling framework

The adaptive scaling framework for system transformation was developed through an iterative, action-research-for-development program on farmer-led irrigation. The framework aims to overcome systemic barriers related to the lack of contextually relevant innovation bundles, appropriate end-user financing, policy frameworks biased toward large-scale irrigation infrastructure and promotion of rain-fed agriculture, weak input and output market linkages, nascent private sector investment and increasing competition for water among sectors. Table 1 illustrates how the adaptive scaling framework has been implemented in two projects funded by the United States Agency for International Development (USAID) – Feed the Future Innovation Lab for Small-Scale Irrigation (ILSSI) and Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) – over the past five years in Ethiopia, Ghana and Mali.



Farmer using solar power to irrigate her crops in Zimbabwe (photo: David Brazier/IWMI).

Table 1. Operationalizing the adaptive scaling framework for system transformation: illustrative examples.

Scaling function and activity	Scaling principle	Operational level and modality
Niche		
Improve consumptive water use by bundling solar pumps, drip irrigation and conservation agriculture for vegetable production.	Responsive to water shortage and land resources as well as market demand for high-value crops.	• <i>Innovation bundle</i> • Multi-actor partnership
Test different agricultural water management scenarios for various genetic fodder varieties to improve the quality and quantity of milk produced by hybrid cows.	Responsive to the market demand for irrigated fodder and milk while dealing with water scarcity.	• <i>Innovation bundle</i> • Research-farmer partnership
Test the bundling of solar pumps with pay-as-you-go or pay-as-you-own financial modalities to lower upfront investment costs. Address gender-related gaps in credit scoring.	Responsive to market segment demands while ensuring the inclusion of resource-poor farmers in bottom-of-the-pyramid markets.	• <i>Innovation bundle and scaling process</i> • Research-women-private sector partnership
Identify gendered preferences for water-lifting technologies and their use for irrigation, domestic and livestock watering purposes.	Inclusive of women and intra-household needs to address water access and use in irrigated value chains, livestock, and water, sanitation and hygiene (WASH).	• <i>Innovation bundle and scaling process</i> • Research-household partnership
Identify solar-powered irrigation potential at national and regional levels using integrated decision-support systems, multi-agent-based modeling, water accounting and suitability mapping to strengthen irrigation supply chains in a sustainable manner and reduce environmental trade-offs.	Responsive to knowledge gaps identified by the private sector to include water-related information in market segments and expansion analysis.	• <i>Scaling process</i> • Research-private-public sector partnership
Reach		
Co-design demand-supply linkages for solar pumps and financing products by identifying the current irrigation situation and user demand. Establish irrigation supply chains/services and different market segments and associated pay-as-you-own financing.	Responsive to market segment demands and heterogeneity of farmers and their farming systems while ensuring the inclusion of resource-poor farmers in bottom-of-the-pyramid markets.	• <i>Scaling process</i> • Research-farmer-private sector partnership
Capitalize on referral mechanisms to stimulate sales and customer acquisition (e.g., proportional to the total number of products sold by sales and service partners).	Responsive to market demands and requirements to close prevailing market linkage gaps for farmer agribusinesses and irrigation supply chains.	• <i>Scaling process</i> • Private sector investment
Facilitate demand-supply linkage pathways by creating awareness in the region and supporting actor networking at regional level.	Accelerate reach through creating awareness, connecting actors and facilitating networks.	• <i>Scaling process</i> • Multi-actor partnership

(continued)

Table 1. Operationalizing the adaptive scaling framework for system transformation: illustrative examples. (continued)

Scaling function and activity	Scaling principle	Operational level and modality
Accelerate		
Provide financial support to private sector companies to de-risk their expansion of financial end-user services to other regions in the country and/or different technology bundles.	Accelerative by de-risking the private sector's expansion of its financial services to a wider region while ensuring inclusion of the different market segments (i.e., tailored financing) and being responsive to market developments.	• <i>Innovation bundle and scaling process</i> • Development partner-private sector-research partnership
Influence the smallholder irrigation development component in Ethiopia's Agriculture and Rural Development Policy, as solution brokers to the Ministry of Agriculture.	Responsive to the high upfront investment costs, underdeveloped irrigation supply chains and suitable technical interventions.	• <i>Scaling process</i> • Multi-stakeholder dialogues
Transform		
Establish/strengthen national multi-stakeholder dialogues to support co-learning, collective action, collaboration and commitment to farmer-led irrigation development.	Inclusive of partners' interests and capabilities to support accelerated action; adaptive by identifying processes/tools/solutions for overcoming identified barriers to scaling.	• <i>Scaling process</i> • Research-farmer-government-public-private sector collaboration
Establish innovation scholarships and internships with the private and public sectors to close the research-private sector knowledge divide, stimulate local innovation and job readiness of the next generation of professionals.	Reflective by stimulating contextually relevant innovations in-country, and by identifying the knowledge gaps and needs of the private sector.	• <i>Scaling process</i> • Research-private sector collaboration

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