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Modalities for Scaling up Sustainable Land Management and Restoration of Degraded Land

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for rural dryland communities

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The program is led by the International Centre for Agricultural Research in the Dry Areas (ICARDA), a member of the CGIAR Consortium. CGIAR is a global agriculture research partnership for a food secure future.

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Modalities for Scaling up Sustainable Land Management and Restoration of Degraded Land

Abstract

To tackle inter-connected global challenges of population growth and migration, climate change, biodiversity loss, and degrading land and water resources, changes in land use and management are needed at a global scale. There are hundreds of options that can improve the sustainability of land management and prevent or reverse degradation, but there are almost as many socio-cultural, institutional and policy barriers preventing their adoption at scale. To tackle this challenge, the Consultative Group for International Agricultural Research's Dryland Systems Program and the UN Convention to Combat Desertification convened an expert group to consider barriers and incentives to scaling up sustainable land management (SLM) and land restoration practices, as part of the first Global Land Outlook. The group reviewed existing frameworks for scaling up relevant interventions across a range of contexts, and identified eight critical success factors: i) adaptively plan; ii) consistently fund; iii) select SLM options for scaling up based on best available evidence; iv) identify and engage with stakeholders at all scales; v) build capacity for scaling up; vi) foster institutional leadership and policy change to support scaling up; vii) achieve early tangible benefits and incentives for as many stakeholders as possible and viii) monitor, evaluate and communicate. Incentives for scaling up were identified for the private sector, farmers and their communities and policy makers. Based on these findings a new framework for scaling up is presented that analyses the contexts in which there is evidence that specific SLM interventions can be scaled up and out, so that scalable SLM options can be screened and adapted to these contexts, piloted and disseminated. This will then help countries achieve land degradation neutrality and comply with the Sustainable Development Goal 15, "Life on Land".

1 Introduction

Both developing and developed countries are facing the inter-connected challenges of population growth and migration, climate change, loss of biodiversity, and degrading land and water resources. We are now entering an era where our thirst for material growth is bringing us to the edge of planetary boundaries where ecosystems may collapse (Rockstrom et al. 2009; Steffen et al. 2015). Approaches are needed to achieve the grand goals of living within planetary boundaries, alleviating poverty, securing food and water supplies and protecting the natural resource base. These goals formed the basis of the Millennium Development Goals and their successors, the Sustainable Development Goals (UN 2016)

We need to recognize this inter-connectedness more widely and rapidly in order to achieve sustainable land management at scale, providing options that can transform the practices of millions of land users. Some 169 out of the 194 countries that are parties to the UNCCD report that they are affected by land degradation (Wischnewski, 2015). With current rates of land degradation of as much as 10 to 12 million ha per year and the fact that there is a need to increase terrestrial food production by some 70% by 2050 to satisfy demands of a growing population (FAO, 2009) there is an urgent need to scale up and out successful, profitable and resource efficient SLM practices in order to preserve the natural resource base that humans depend on for life. As much as 500 million out of

2 billion ha of degraded land has the potential for restoration mainly in developing countries (UNCCD, 2016a). There is recognition that both the public and private sector need to work together with land users (World Economic Forum 2012) in order to bring about the transformation in land use and management needed to achieve the goals of land restoration and in particular SDG 15 that aims to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss".

There are hundreds of examples of interventions to improve land management and prevent or reverse land degradation at the scale of farms, villages, communities or watersheds (e.g., WOCAT, 2007). However, our inability to scale out technological, institutional and policy solutions to regional, national and international scales severely restricts our capacity to address the global challenge of preventing and reversing land degradation (Zucca et al. 2013).

The concept of Sustainable Land Management (SLM) is a unifying theme for global efforts on combating desertification, drought and land degradation, climate change and loss of biodiversity (Thomas, 2008; World Bank, 2008; Reed and Stringer, 2016). SLM combines technologies, policies and activities aimed at integrating socio-economic principles with environmental concerns that maintain or enhance production and ecosystem services, reduce the level of production risk, are economically viable, socially acceptable and protect the natural resources (FAO/FESLM 1993).

This paper specifically examines how SLM can be scaled up and out as part of the international community's efforts to avoid reaching our planetary boundaries. Scaling up focuses on "expanding, replicating, adapting and sustaining successful policies, programs or projects in geographic space and over time to reach a greater number of people" (Cooly and Linn 2014). For scaling out to occur, institutional changes (e.g. within donor and development organizations and by policy makers) are needed to create an enabling environment that can promote the adoption of SLM practices from farmer to farmer, and community to community across stakeholder groups (Douthwaite et al., 2007). To examine these issues, we first review theoretical and operational frameworks for scaling up and out from the literature, identifying key elements that can explain how and why SLM policies and practices are adopted by institutions and land managers. Then, based on the findings of an international expert workshop , we consider barriers and success factors, identifying eight principles for successfully scaling SLM up and out, and discuss incentives for the private, farming and policy communities to scale up SLM. Finally, the paper brings together insights from the literature and expert workshop to develop a practical framework for scaling SLM up and out to reverse land degradation and help meet the UNCCD's objectives to achieve land degradation neutrality and sustainable land management (UNCCD, 2012; 2014).

2 Frameworks for scaling up and out from the literature

There is a rich literature on the adoption and diffusion of innovations by farmers (based on Rogers' (2003) diffusion of innovations model), which is pertinent to scaling out SLM. Of particular relevance is the attention of this model to the characteristics of innovations that make them more or less adoptable, whilst considering the characteristics of farmers that make them more or less likely to adopt the innovations. In parallel with this, a broader literature has developed to explain barriers to the adoption of innovations, such as SLM, that benefit the environment. Early models focused on providing information, assuming that increased awareness and understanding of the benefits of SLM would

promote uptake (Burgess et al., 1998). More recently, it has been recognized that there are a range of factors that influence the adoption of innovations, which can be summarized as:

1. External, contextual factors, including demographic (e.g. age and gender), socio-cultural (e.g. prevailing norms), economic (e.g. incentives or disincentives), and political and institutional factors (e.g. infrastructure to enable the adoption of SLM); and

2. Internal, individual factors, including attitudes, values and beliefs relating to environment, compared to other competing non-environmental motives, personal capabilities (e.g. knowledge and skills, disabilities), resources (e.g. time and money), habits, emotional involvement with environmental problems such as land degradation and a belief that it is possible to bring about change through an individual's action.

This has led to the introduction of a multi-level perspective with a nested hierarchy of at least three levels beginning with relatively rapid changing micro-level (individuals, land users); stabilizing mechanisms of meso-level (communities, local and regional authorities) and slower changing macro-level of policy and national and international arenas that usually cannot be influenced by individuals (Hermans et al., 2013).

To date, there has been limited application of this broader literature to SLM. However, a number of operational frameworks have been developed by organizations working directly with land managers. Designed to facilitate scaling up and out on the ground, these frameworks are informed more by experiential knowledge than academic theory, and yet they resonate with the theoretical literature in a number of ways. We discuss three frameworks below which all strongly emphasize learning processes.
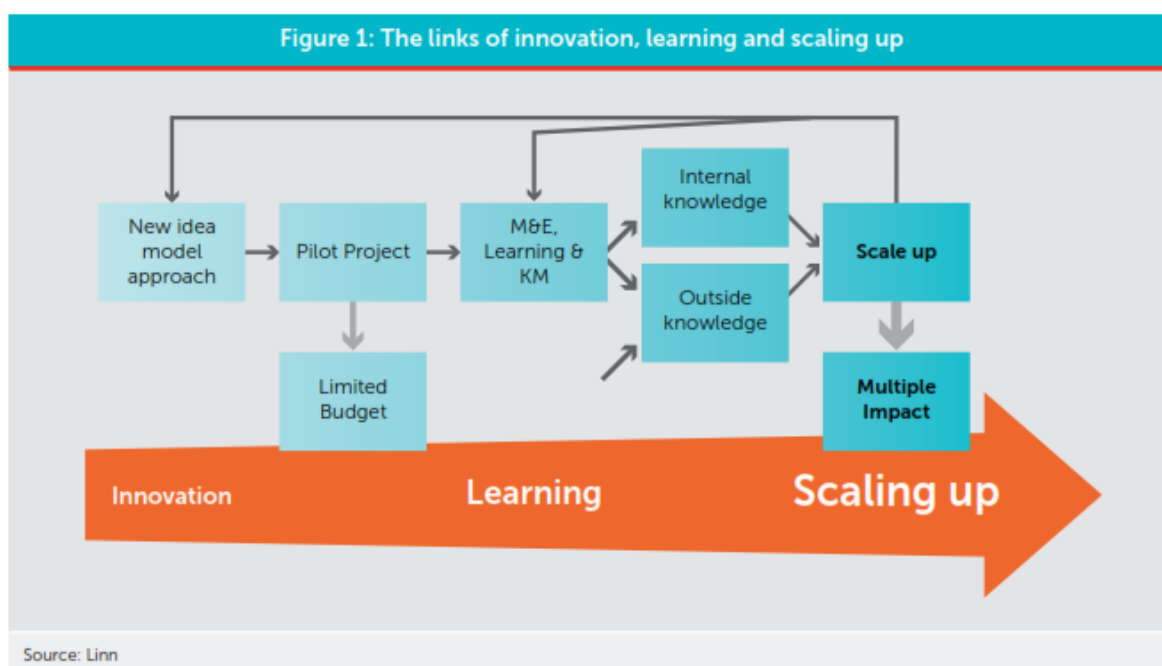
Figure 1. The IFAD scaling up framework (Linn et al. 2010).

First, the International Fund for Agricultural Development (IFAD) scaling up framework is presented in Figure 1 showing the central role of learning in scaling up innovations (Linn et al. 2010). In this framework lessons from successful interventions, derived from

monitoring and evaluation usually at a small or pilot scale, are used to scale up through expansion, replication and adaptation. The framework emphasizes the need for a scaling up strategy from the beginning, identifying the extent of scaling in terms of the area and numbers of people to be targeted, and the financial, policy, institutional and cultural barriers to scaling that may need to be overcome. It suggests that the main drivers of scaling up and out are: a sound intervention that has worked at a small scale; vision and leadership that recognizes the scope and feasibility of scaling and pulls other parties along; external factors that encourage scaling including donors, communities, international agreements; and finally incentives that reward practitioners for implementing land use changes.
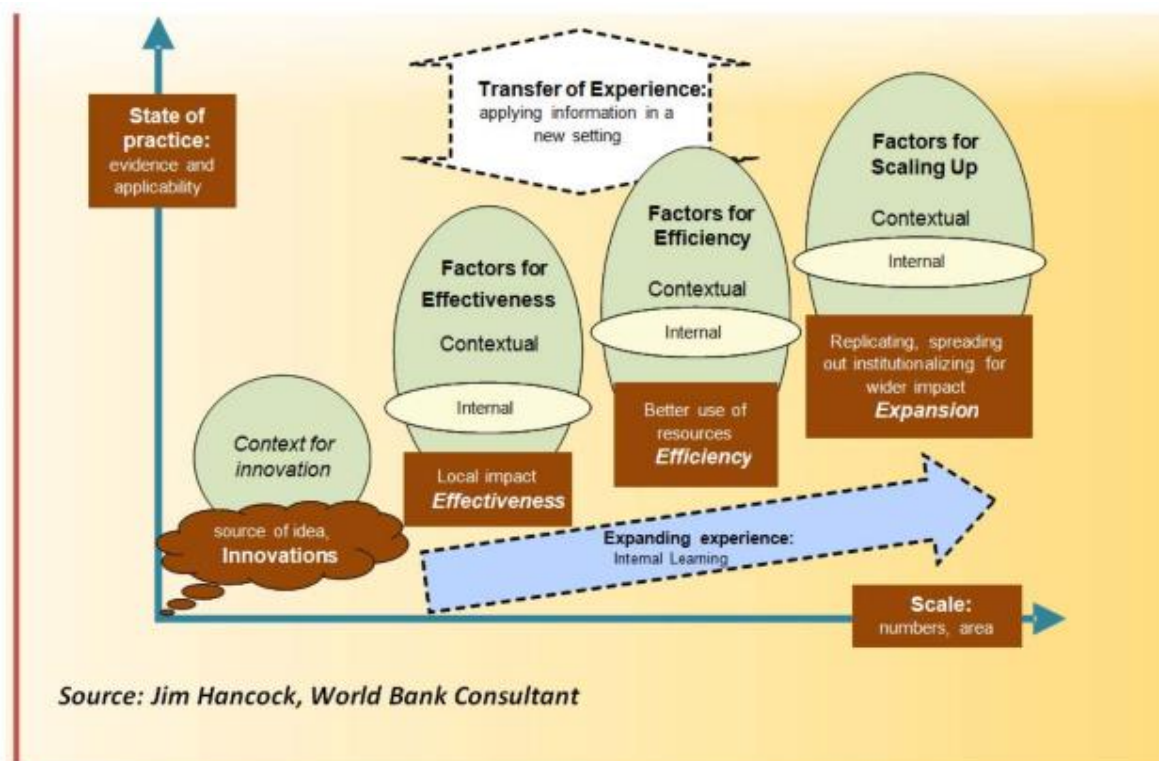
Figure 2. The scaling up process (MSI, 2012).

Second, the Management Systems International (MSI) framework (Figure 2) and consists of three steps with ten tasks (MSI, 2012): Step 1 involves creating a vision, assessing scalability, filling information gaps and preparing a scaling up plan; Step 2 involves establishing the pre-conditions for scaling up, legitimizing change, building a constituency and realigning and mobilizing the needed resources; and Step 3 involves implementing the scaling up process, modifying organizational structures, coordinating action and tracking performance and maintaining momentum (see Cooley et al. (2012) for a manual of tools and techniques for practitioners). This framework is the most comprehensive in terms of outlining methodological steps, distinguishing between what is being scaled up and the best scaling up methods that are appropriate for the type of intervention proposed. The MSI identifies three types of scaling up methods (for the expansion phase in Figure 2): i) expansion, involving growth, restructuring or decentralization, franchising and spin-offs, usually via an increase in the scope of operations of the organization that originally developed and piloted the innovation; ii) replication, involving policy adoption, diffusion and spillover, usually done by others including the public sector and can involve chains of organizations such as NGO-to-NGO transfer; and iii) collaboration, involving formal partnerships, joint venture and strategic

alliances, networks and coalitions e.g. via public-private partnerships, and formal and informal networks based on varying degrees of collaborative agreements ranging from memorandum of understandings to formal contractual obligations of each participating partner.

Third, the World Resources Institute (WRI) produced a framework that focuses on a pragmatic approach to forest and landscape restoration (Reij and Winterbottom, 2015). Six steps are involved that the authors state are not necessarily sequential: i) identify and analyse successes; ii) work at grass roots level via farmer-to-farmer visits, peer-to-peer training, training of trainers, development of community-based institutions and best practice competitions; iii) create enabling policies and legislation for out-scaling involving policymakers; iv) develop a communication strategy for increasing public awareness and successfully reaching target groups; v) develop value chains of marketable products so that land users can capitalize on markets; and vi) develop research to fill gaps in knowledge about multiple impacts of interventions and costs/benefits. The first step was subsequently expanded by WRI through its application of the framework to climate change adaptation in India (Appadural et al. 2015), suggesting that identifying and analyzing success could consist of identifying good practice indicators, identifying readiness to scale (equivalent to 'assessing scalability' of the MSI framework), and understanding scaling pathways (equivalent to MSI's scaling up methods) and conditions of scaling, such as resources, partnerships and networks, local contexts and knowledge management (equivalent to Step 2 of the MSI framework on establishing the pre-conditions for scaling). In contrast to the MSI scaling methods, which focus on process (expansion, replication and collaboration), WRI identify four scaling pathways that focus on who drives the process: i) centralized scaling (government); ii) multi-actor driven e.g. government, NGOs and farmers; iii) NGO driven; and iv) spontaneous scaling by individuals or informal practice.

Looking across the three operational frameworks for scaling up and out, the IFAD framework focuses most on processes and emphasizes the role of learning. The MSI framework provides more structured methodological guidance, emphasizing the need for collaborative approaches. The WRI framework focuses more on agency, emphasizing how scaling up and out can be driven differently by different actors. All three operational frameworks focus more on the characteristics of SLM innovations themselves and external, contextual focus, than they do on internal individual factors. Despite these broad differences, and the order in which steps are presented, the three operational frameworks have much in common with each other and the theoretical literature, if seen as an iterative interactive process rather than an application of a blueprint. All three operational frameworks:

- Draw on diffusion theory, and reflect the external, contextual factors identified elsewhere in the literature as being important in determining the adoption of innovations;
- Identify a successful intervention, defining what is to be scaled up, which is usually either a technology, a process or organizational innovation;
- Select a scaling up method from the range available;
- Develop a vision and assessment of the scalability of the intervention or innovation through a thorough diagnosis that includes all actors or stakeholders, is interactive, multi-disciplinary, and multi-sectoral;
- Identify barriers or constraints to scaling and solutions to remove them, perhaps using a theory of change process that results in a favourable enabling environment;

- Develop a communication and constituency building process for increasing public and stakeholder awareness;
- Track performance through a monitoring and evaluation process that also helps to quickly identify bottlenecks and can suggests course changes in the process and provide feedback for modifications, innovations, etc.

3 Barriers and success factors for scaling up and out

To explore barriers and success factors for scaling up and out, 30 experts in SLM from international agencies, NGO's, the CGIAR, and universities were invited to a professionally facilitated expert workshop in Jordan, on 11th April 2016 by the CGIAR Dryland Systems Research Program. The workshop identified key success and failure factors in scaling up best SLM practices, lessons learned, and the barriers and incentives for scaling up at the levels of farmers/communities, policy makers and the private sector. Barriers to scaling up SLM differ between contexts and over time. Identifying the main barriers or drivers in any particular context from an array of contributing factors is a key first step and the scaling up process should adapt to these (Campbell et al., 2006) and not get too entangled in the seemingly endless complexity of socio-ecological systems. In addition, scaling up may be more challenging in particularly diverse or unique agro-ecosystems and socio-cultural settings, where SLM technologies and approaches have to be significantly adapted to work in each setting. Many SLM technologies and approaches, especially those based on water management, may not be viable under a significantly drier future climate. Key barriers to scaling up and out SLM identified by workshop participants included a lack of:

- Technical options for the specific need and context considered and/or awareness of them by land users;
- Adequate institutional human and financial resources for capacity building and extension services;
- Finance at macro- and micro-level within public government budgets, local organizations and individuals and aversion of private sector investments for smallholders;
- Political will to address problems of mainly marginal areas;
- Awareness of innovative approaches to incentivize SLM such as payments for ecosystem services and insurances.

Additional barriers included:

- Conflict among actors over resources such as access to and availability of land and water;
- High investment risk for individuals and the private sector;
- Loss or turnover of individual 'champions' that drive the interest and processes in specific situations.

Despite these contextual challenges, workshop participants identified eight critical success factors that can be designed into scaling up strategies. This rest of this section considers each of these factors in turn, and considers how they can contribute to successful scaling up and out of SLM in the widest possible range of international contexts. Table 1 illustrates the success factors in four selected case studies. Appendix I lists these and other case studies presented by workshop participants.

Table 1 Matrix of success factors and case studies

Key success factor	Case study 1 Morocco 'Programme Oasis Sud'	Case study 2 Project Wadi Attir, Israel	Case study 3 Western Rajasthan, India	Case study 4 ALTAGRO project in Peruvian altiplano
1.Consistently fund and adaptively plan	Achieved financing of 46 district development plans from national budget. Budget increased from a $3 million program to a cumulative budget of $77 after 9 years	Donations and government support	Limited to a research grant	Long term research and development grant from several donors and a successful revolving fund
2.Select SLM options for scaling up and out, based on best available evidence	SLM practices selected and spread across 195,000 ha included the promotion of sustainable water management, erosion control and sand dune fixation	Perennial plant cover with agroforestry trees, construction of catchments and terraces, soil conservation practices	Drought proofing via tolerant varieties, soil and water conservation, integration of perennials, rain water harvesting, diversification and inclusive value chains	Quinoa cropping, dairy farming and trout farming and their value chains
3.Identify and engage with stakeholders at all relevant scales, recognizing and appealing to the motives of different groups	Includes wide variety of development actors and empowerment of women	Limited to one 'wadi', developed by the Sustainability Laboratory, Hura Municipal Council and scientists from a university	Recognition of household heterogeneity, creation of multi-stakeholder innovation platforms and village development committees	129 rural communities engaged
4.Build capacity for scaling up and out	Inter-community collaboration is facilitated	Limited to one catchment. Involves a regional education center	Capacity to self-organize through village development committees and innovation platforms	Training of 84 families in 7 groups for tout farming as a new enterprise. Training of 1175 and 563 families in quinoa cropping and dairy production, respectively
5.Lead: foster institutional leadership and policy change to support scaling up and out	Facilitated community development plans		Nurtured institutional mechanisms at village to regional level	Organized producer groups
6.Mobilise: achieve early, tangible benefits and incentives for as many stakeholders as possible to engage in activities to scale up and out	11 urban municipalities and 45 rural districts reached			Availability of credit to switch practices was crucial
7.Reflect and communicate	Project needs a strategic socio-economic vision		Participatory agro-ecosystem analysis facilitated cooperation and willingness to adopt SSLM practices	

3.1 Adaptively plan

Workshop participants emphasized the need to design scaling into projects from the outset. The majority of SLM research to date has been conducted at case study scales, ranging from villages to water basins and landscapes. Upscaling is typically considered when SLM technologies and approaches have been demonstrated to work at these local scales. Much less research and practice has explicitly considered the design and adoption of SLM at national and international scales. Limited understanding of replicability of SLM in the ecological and socio-cultural contexts that differ from the original contexts where options were developed and of adoption processes at these larger scales makes it difficult to design scaling processes. However, without planning for scalability, opportunities to scale up SLM may be missed (e.g., Campbell et al., 2006; Reed, 2016).

There are a number of approaches available to help plan for scaling up SLM, for example Logical Framework Analysis (Hersoug, 1996), Theory of Change (Quinn, 1988) and impact planning (Reed, 2016). Each of these approaches attempts to link broad SLM scaling up goals to specific objectives, and key messages and activities that can be used to achieve these objectives. They also emphasize the identification of risks (and risk mitigation strategies) and use milestones and/or indicators to monitor progress towards goals. By identifying barriers to scaling up SLM, these approaches seek to mitigate these risks and overcome barriers as part of the design process, from the outset. Many of these approaches combine top-down approaches (e.g. via national and international policy processes such as UNCCD National Action Plans and Land Degradation Neutrality Plans to achieve the Sustainable Development Goals) with bottom-up approaches (e.g. via local stakeholder networks). Setting clear milestones that relate to scaling via a well-defined theory of change and impact pathway helps to bring divergent views and options together cementing a joint understanding and vision of the objectives of scaling up and out.

3.2 Consistently fund

The costs of restoring degraded land are estimated to be in the billions of dollars; far greater than is available from public funds (Sewell et al., 2016). Scaling SLM up and out requires consistent funding, and UNCCD has historically been the least well funded of the Rio Conventions. To overcome this constraint, it may be necessary to consider alternative funding models. However, the approach to scaling up will typically need to be adapted to the funding model, for example:

- Payments for Ecosystem Services schemes may preferentially promote upscaling of SLM technologies that deliver measurable improvements in climate change mitigation (carbon sequestration and storage), water quality and biodiversity benefits. In privately financed schemes, upscaling may prioritize locations or systems where benefits can be delivered most cost-effectively, whereas public schemes may prioritize locations where the greatest public benefits can be derived, whether or not these are cost-effective in terms of ecosystem markets (Reed et al., 2017). Ideally these different aims need to be brought together to develop a solid investment case for public-private partnerships in place-based schemes that are adapted to local needs and priorities (Reed et al., 2017).
- International donors each have different priorities, which will influence the selection of SLM technologies and approaches likely to be promoted in upscaling.

- National development and land use planning can be a useful vehicle for upscaling SLM, but depending on the policy framework, may be top-down or more bottom-up. Table 1 and Appendix I provides an example of SLM being promoted via community development planning in Morocco, which combined both top-down and bottom-up approaches to scaling up and out.
- Corporate Social Responsibility (CSR) or Shared Value funds (Porter and Kramer, 2011) from multinational corporations may fund SLM upscaling and, depending on the priorities of the company, may shape the upscaling process in different ways. For example, for some companies that depend on agricultural commodities, CSR may focus on creating sustainable value chains, which may prioritize SLM options that provide clearly measurable environmental sustainability outcomes (Syngenta. 2016). Other companies measure CSR outcomes in the number of "lives changed" and may be more interested in SLM options that provide measurable social and economic sustainability outcomes.
- De-risking investments remains a concern for the private sector no matter what their objectives are (Cornell et al., 2016). This requires working with finance experts to de-risk restoration investments, for example by combining both private and public funding (e.g. the sort of place-based scheme proposed by Reed et al. 2017).

3.3 Select SLM options for scaling up and out based on best available evidence

There are many types of evidence that may be used to select the most relevant SLM options for scaling up and out. Workshop participants emphasized the importance of economic evidence to help convince both policy makers and land managers to invest and re-direct policy and practice towards financially viable SLM options. Economics can become a common language to help establish meaningful dialogue around land use issues. Establishing the economic value of land and the benefits of restoration and sustainable management can help position SLM as a competing priority with other development needs.

However, while economics can be a powerful driver of decisions, the social and cultural dimensions of land use change should not be overlooked when introducing new SLM options (see next section). A range of non-monetary valuation techniques have been developed to capture collective meanings and significance ascribed to natural environments. These techniques are often participatory and deliberative, in order to include multiple perspectives and dimensions of value (Kenter et al., 2015). Taking this more pluralistic approach to the benefits (or otherwise) of SLM recognizes that evidence is rarely clear-cut or uncontested. Rather, increasingly diverse knowledge claims need to be evaluated as part of the decision-making process (e.g. Sanderson, 2006; Crilly et al., 2010).

When scaling up and out, context becomes particularly important to ensure SLM technologies and restoration protocols are appropriate for the specific ecosystem/landscape. Building on these points, workshop participants pointed out that management and decision-making needs to interpret evidence in context (critically considering the context evidence was produced in, compared to the context in which it is now being considered), and to be more adaptive, reconsidering decisions as new evidence emerges.

3.4 Identify and engage with stakeholders at all relevant scales, recognizing and appealing to the motives of different groups

Effective engagement of stakeholders across multiple scales is critical for scaling up SLM. Workshop participants described examples of SLM technologies and approaches that are not scalable because they do not translate into sustainable or profitable systems when applied in different biophysical contexts and scales. Scalability may also be limited if SLM technologies and approaches are not socially or culturally appropriate when applied beyond the context they were developed in. To overcome these challenges at local scales, SLM technologies and approaches are increasingly being co-developed with land managers and other stakeholders, to ensure that they are well adapted to local needs. However, co-designing SLM at regional, national and international scales is a significant logistical challenge, and there are few examples of SLM technologies and approaches that have been co-designed a priori with stakeholders at these scales, with upscaling in mind. Instead, SLM technologies and approaches tend to be adapted ad hoc as they spread to new locations (c.f. Rogers, 2003).

Workshop participants identified three steps to integrate stakeholder engagement into the upscaling process. The first step is to systematically identify stakeholders in SLM from local to national and international scales, characterizing their relative influence and interest in SLM, and identifying how any barriers to engagement may be overcome. This should include the identification of both winners and losers, and those who can facilitate and block upscaling (Reed et al., 2009). The second step is to engage at the highest possible levels with members of the policy community, from junior and senior civil servants to government ministers. Although rare, there are persuasive examples where SLM has been scaled up via national policy processes that connect to local community engagement. For example, in Morocco, SLM was integrated into a national community development planning process, providing resources for community engagement at local levels while promoting SLM nationally (see Table 1 and Appendix I). Once stakeholders have been identified and engaged, the third step is to select and adapt appropriate SLM options for upscaling. Taking this approach, the emphasis of upscaling shifts from geographical to social scales, targeting different technologies and approaches to different social groups, based on their needs, constraints and livelihood strategies.

3.5 Build capacity for scaling up and out

Scaling up SLM practices requires capacity building across all scales from farmers, the private sector to national and international policy makers. Once a decision is taken that an intervention indeed has potential for scaling up, the limits or boundaries need to be defined e.g. a watershed, national or international scale. Similarly, as scaling up can take significant time (often greater than 10 years) it is important that institutional capacity and incentives are built to maintain scaling beyond the tenure of any individual within an organisation. As interventions are highly context-dependent, disseminating the principles of scaling may be more important than a specific option thought to fit a particular context. For example the CASCAPE project, supported by the Netherlands and part of its Agricultural Growth Program of Ethiopia, aims to strengthen the capacity of stakeholders to scale up best practices for improving agricultural production (CASCAPE 2015). Similarly, the WRI model relies on capacity building at grass roots level via farmer-to-farmer visits, peer-to-peer training, training of trainers, development of community-based institutions and best practice competitions (Reij and Winterbottom, 2015). Multi-institutional projects and programs are also a means to ensure capacity is built across the range of actors involved.

3.6 Lead: foster institutional leadership and policy change to support scaling up and out

Workshop participants identified the need to engage a champion from one or more of the actor groups who can lead and link different interests. This may be an enthusiastic NGO leader, member of a farmer group, politician, financier, or a research team leader.

It is possible to work with champions to develop an influencing/engagement strategy with key stakeholders, working where necessary with influential intermediaries, to build momentum for changes in policy or practice. There is a rich literature on the role of opinion leaders in the diffusion of agricultural innovations, based on Roger's (1976; 2003) work. More recently, techniques such as Social Network Analysis have been used to identify opinion leaders and predict the speed and pattern of diffusion of innovations (Valente, 1996). These methods have shown how the structure of an entire social network (e.g. the density of relationships, their cohesiveness and interconnectivity) can influence decisions to adopt more sustainable land management options (Bodin and Crona, 2009).

3.7 Mobilize: achieve early, tangible benefits and incentives for as many stakeholders as possible to engage in activities to scale SLM up and out

Scaling up and out processes can require sustained inputs from a range of stakeholders including land managers, NGOs research and business communities, donor and policy makers who can facilitate or hinder attempts to scale up. Therefore, to both mobilize and retain stakeholder engagement, it is necessary to provide tangible, early benefits that generate meaningful value for those involved (Campbell et al., 2006; Reed, 2016). In addition to incentivizing the process of scaling SLM up and out, it is important to identify disincentives or perverse incentives that may slow the pace at which SLM may be scaled and lead to disengagement from stakeholders. Examples of factors that may delay stakeholders from benefiting from scaling up include policy targets or carbon markets that promote afforestation of agricultural land and tax breaks and market stimuli that promote unsustainable intensification of agricultural systems. It can be difficult to predict or control these factors so to retain stakeholder engagement, it is important to avoid raising false expectations of the degree and speed with which benefits may accrue and to constantly manage expectations during the process of scaling up.

3.8 Monitor, evaluate and communicate

Finally, it is essential to learn from success and failure alike, to develop best practice in scaling SLM up and out. To do this, it is necessary to monitor progress towards SLM targets and evaluate the impacts of SLM against measures of sustainability, including sustainable livelihoods. The UNCCD's 1st Scientific Conference proposed a knowledge management framework for SLM that involved participatory development of indicators (Reed et al., 2011), and SLM indicators have been proposed to monitor progress towards the SDGs (UNCCD 2015). Such approaches do more than simply provide a measure of progress. They facilitate learning between different stakeholder groups across scales, and if designed and implemented in collaboration with stakeholders, they can enable continuous learning to improve SLM practice and ensure more effective scaling up and out. Where good practice is identified, this needs to be communicated globally to build expertise in scaling up across different contexts. Such communication needs to be

strategic and targeted, tailoring messages to different stakeholders who can play different roles in the process of scaling up and out.

4 Incentives for scaling up

Building on the barriers and success factors in the previous section, expert workshop participants considered incentives for scaling up. Some land degradation can be considered to be a result of the lack of incentives for better land stewardship, epitomized by the concepts behind the 'tragedy of the commons' (Hardin, 1968). The transaction costs to design and implement SLM are often inhibitory and are often considered high risk for resource-poor smallholders and the private sector in particular. As practices are adopted and spread there may be an inverse relationship between scaling and risk (Cornell et al. 2016) as the practices move beyond first adopters and scaling increases, risks may decrease as a result of, for example, sharing costly machinery. Furthermore, the enabling environment in terms of access to land and markets, financial credit, extension services, input supplies is often limiting to rural communities.

Incentives aimed at scaling up SLM need to be designed based on a thorough assessment of stakeholder needs, their local or traditional knowledge and a critical appraisal of existing incentives and their impacts, both negative (perverse) and positive (enabling). Often incentives are not harmonized to encourage multiple benefits and are sometimes conflicting (e.g. agricultural subsidies that encourage an over production through intensification but that result in greater environmental damage from land degradation and fertilizer contamination of waters). For SLM, that often requires long-term implementation periods to realize benefits, there is a particular challenge to align incentives for short-term private and local benefits, often within one growing season, with long-term public benefits.

4.1 Private sector incentives

With few exceptions, the private sector and especially large multinational agricultural conglomerates have yet to exploit the provision of input supplies, technologies, market chains and other products and services for SLM on smallholder farms and yet this sector is thought to produce much of the world's food e.g. 70- 80% in Asia and Africa (IAASTD 2009; IFAD 2011) and will need to feed growing populations. Reasons for this include lack of financing, inhibitory laws and regulations, weak distribution channels and insufficient labour (Kohl et al 2014). Opportunities have been identified for private sector involvement via new technology services and payment schemes. These include much more accurate location analyses such as road infrastructure, cellular phone coverage, internet presence, distances to banks/finance, availability of electricity and the presence or absence of market barriers. New geographic information systems and spatial analyses can now be used to easily generate maps of populations, markets, and risks that can help target SLM practices.

Advances in the private sector development of new Information & Communication Technology (ICT) such as advanced soil and water sensors and monitoring equipment will allow farmers to monitor soils and crops more accurately, build on farmers' abilities to use resources efficiently and monitor animal health. These technologies are likely to be central to farmers of the future including small holders and should appeal to young farmers who already use mobile devices. Thus not only efficiencies can be improved but also social benefits through increased interest in farming and business development in

rural and peri-urban environments along with increased financial benefits (Deloitte Review, 2016).

The private sector can target existing retailers rather than small holders directly and thereby improve their distribution channels and can access information held predominantly by the public sector given incentives. A particular target could be retailers who not only sell products but who can also offer advisory services that governments are unable to. Thus coupled packages of products and advice can provide greater growth opportunities especially in areas where digital and advisory capacities are poor. Here hubs of new economic activities in small to medium-size towns (INTELI 2011; Hesse et al., 2013) may offer the required scales to attract the private sector and create jobs in the agricultural and service sectors. The provision of information, better management and productivity can be expected resulting in trust and repeat customers.

Innovative payment methods will also help attract the private sector. Here awareness, advantage, affordability and access have been identified as key determinants for adoption and scaling (Tam et al, 2014). The retail sector has worked to develop payment schemes designed for cash-poor consumers who may not have access to banks. These include mobile money, escrow services, small loans and mobile vouchers (Martin et al, 2016) e.g., AntFinancial. Alifinance has developed a scoring model in China based on online activity for 16 million small microenterprise vendors showing the scope of such schemes (Hanouch and Kumar, 2013). Much can be learned from the general retail sector and how to apply this to small holder farmers and the promotion of SLM.

Private sector flexibility in the timing of sales can greatly help smallholders via sales of input vouchers for seeds and fertilizers etc. when farmers have available cash and delivery of products when needed as this can significantly increase use and productivity (Carter et al, 2013). Mobile banking will also help better use of the vast amounts of remittances from abroad avoiding high interest rates on international transfer by other means.

Retailers, smallholders and entrepreneurs can help by becoming involved in multiple services via cloud sourcing and e-commerce on weather forecasts, insurances, crop purchasing prices in different markets, soil maps, recommended crops and varieties for their locations, water availability, interactive mobile applications and videos on crop, pest and disease management etc. Dissemination of farmer practices can now be promoted by the farmers themselves through activities such as Digital Green (Gandhi et al, 2007), thereby creating greater demands for products.

To realize these opportunities, the private sector needs incentives and co-financing for large scale public-private partnerships. In particular, there needs to be a focus on de-risking investments in land-based projects via guarantees from the public sector if projects fail, tax allowances for investing in restoration projects (Cornell et al., 2016). These future opportunities will require innovative partnerships, greater collaboration and connectivity amongst stakeholders together with technological innovations along agricultural value chains. These value chains are increasingly being viewed as closed-loop chains rather than the traditional linear chains from production, manufacture, distribution, retail, consumer and disposal (World Economic Forum 2010). As profit margins are generally narrow in agriculture there is increased interest from the private sector in scaling up and out that can stimulate such partnerships. With driving influences from major NGOs for greater engagements of the private sector with small holders, the conditions for opportunities to sustainably produce food while taking good stewardship of the land via innovative partnerships appear promising (Oxfam 2010).

4.2 Incentives for farmers and their communities

Farmers often improve conventional 'transfer of technology' practices and the efficiency of their operations using natural processes and beneficial on-farm interactions such as nutrient recycling thereby reducing their costs for inputs for example (Pretty 1995). However the number of farmers that achieve these benefits are generally small as such changes are not without costs for labour, inputs such as agrochemicals and machinery, etc. Engaging with innovative farmers is probably one of the quickest ways to spread innovations and factors that determine whether or not a farmer can and is willing to innovate include their age and experience, strong personalities, if they are relatively rich, previously exposed to innovation, generally are full-time farmers and involved in integrated farm systems (Reij and Waters-Bayer, 2001). Incentives to encourage such farmers should be designed that enable these innovators to flourish. As part of a general strategy to engage stakeholders (e.g. ELD, 2015b; Reed, 2016) there are a number of processes that can encourage innovation and testing of interventions. Farmer field schools (FAO, 2015) and farmer competitions for example, bring prestige and can strengthen cultural identities enabling greater knowledge exchange and learning. Alongside this it is important to avoid the capture of benefits by elites and differentials in power relations and these need to be handled in transparent ways to ensure trust and commitment. Farmers can be involved in scaling up SLM practices by self-organizing into groups and interacting more with public and private sectors.

Resource poor farmers in particular are unlikely to switch land management practices if there are no rapid returns to their investments usually within one growing season. Any introduced SLM option must add value or make farming easier to be attractive and adopted. For example, options that increase labour requirements without support to hire labour is unlikely to be adopted. Governments need to provide and/or improve on basic services including infrastructure, health, education to improve the enabling environment for SLM. Incentives for farmers that governments can establish include removal perverse incentives such as fuel subsidies (see below and ELD 2015a).

## 4.3 Incentives for policy makers to promote scaling

More than anything policy makers require solutions to the major challenges that consider the range of stakeholders and that they can be associated with in terms of a legacy of current actions and a future vision of what the environment would look like with implemented SLM practices. Policy makers will likely respond more readily to evidence that the implementation and scaling up of SLM practices will contribute to today's burning agendas such as unemployment, migration from drylands of Africa and West Asia into Europe, food security in fragile states, assurance of future capacities of natural resources to provide goods and services for society and the private sector. Equally important is evidence that the neglect of the land will result in increasing scarcities of food, water and employment. Evidence, data and information expressed in terms of the indicators that are required for SDG's, national development and action plans and associated reporting for, for example, UN conventions, is likely to receive greater attention than data on areas of land degraded or tons of soil lost by erosion.

Sound business cases are required for the implementation of SLM practices and the multiple benefits obtainable in terms of job creation, income generation, improved productivity and the provision of other ecosystem services such as opportunities for eco-tourism and the retention of cultural identity and customs related to their natural

environment. The business case needs to be built on the economic value of the land and benefits of SLM and what is lost when land is degraded or goes out of productive use (ELD, 2015). SLM needs to be presented in the context of the multiple sectors that both benefit and lose from good/bad land management e.g. agriculture, environment, water and energy.

5 A new framework for scaling up SLM options to reverse land degradation

Here we combine common insights and steps from the theoretical and operational frameworks in Section 2 with information on barriers, success factors and incentives for scaling up and out from the expert workshop in Sections 3 and 4 to propose a new framework for scaling SLM up and out. Figure 3 synthesizes the most important steps from each of the previous operational frameworks with additional insights from theory and practice that have the capacity to facilitate more effective scaling up and out. The new framework builds on the framework for monitoring and evaluating SLM options that arose from the UNCCD's First Scientific Conference (Reed et al., 2011). The latter framework built on the work of several other efforts to be useful across scales from the field, local to national scales and incorporated multiple knowledge sources for policy makers and land users. Hence it is considered appropriate for use to understand and design scaling up procedures.
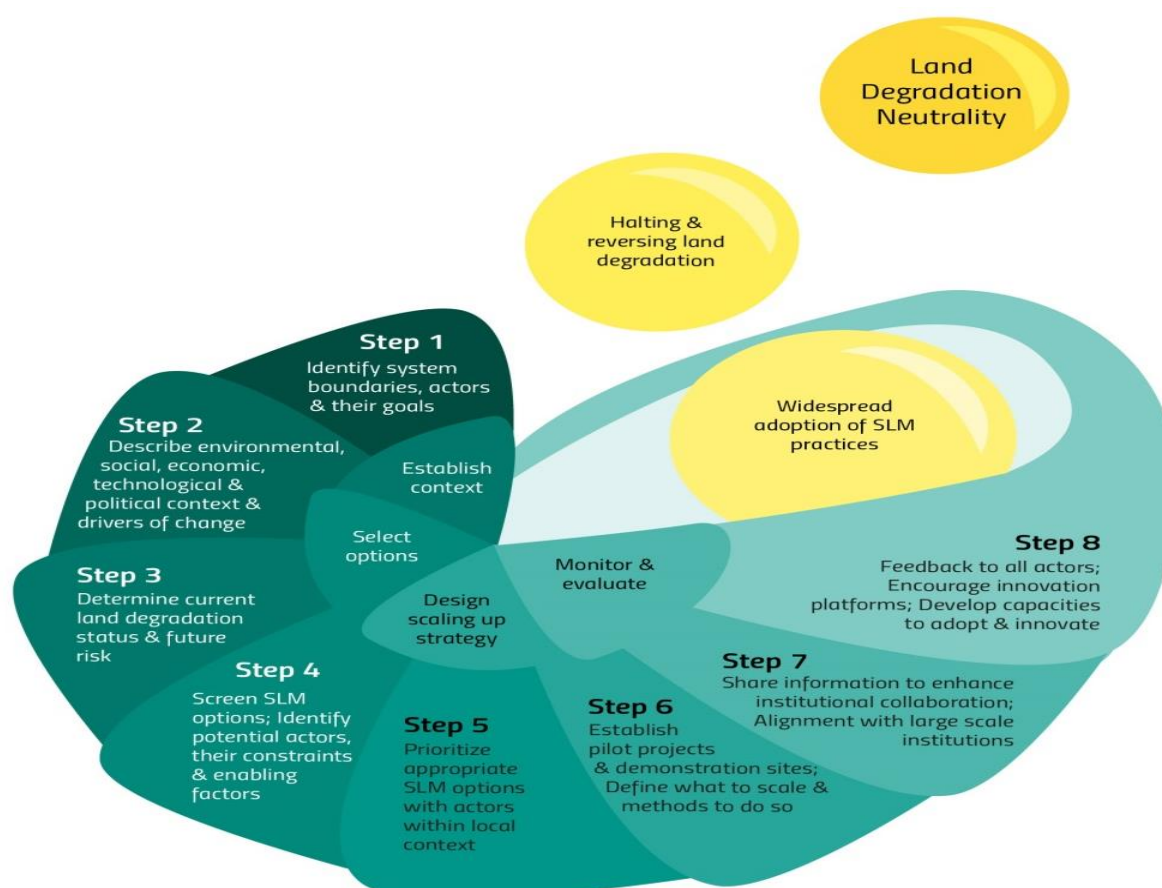
Figure 3. A framework for scaling up SLM options

The scope of scaling needs to be determined at the outset setting the boundaries as either biophysical or administrative (Step 1 Fig 3). Similarly, an inclusive process is

required for all stakeholders or actors that have an influence on how land is used. Through the identified actors a thorough diagnosis of the cultural, social, economic, technological, political and environmental context and the main drivers of change can be identified (Step 2). Using the indicators proposed by the UNCCD and others (UNCCD, 2015; UNU, 2011) the baseline state of land degradation needs to be defined (Step 3). This is followed by a screening of potential SLM options from various perspectives including improvements in crop or biomass productivity, economic cost/benefits, social and cultural acceptance, the identification of potential adopters, their constraints and prerequisite conditions as described in the list of features common to frameworks for scaling up and out at the end of section 2 (Step 4). A parallel process ensures that the potential SLM options fit to the context and constraints of the adopters (Step 5) particularly in relation to the factors identified at the end of section 2. Next on the ground trails of prioritized options are established through pilot and demonstration sites (Step 6) with a clear idea on what is being scaled (technology, process or organizational component). Assuming that the interventions have already a sound base of success or not, a dissemination strategy (Step 7) begins in parallel to step 6.

Whether or not there is a sound basis for success depends on the sort and range of evidence that exists. The standards of evidence range from an innovation with minimal objective evidence, a promising practice with anecdotal reports, a model that has positive evidence in a few cases, good practice with clear evidence from several cases, best practice with evidence of impact from multiple contexts and through a meta-analyses and finally a policy principle that is proven (MSI, 2012). The promotion of an innovation or intervention generally relies on evidence from this range but also to what is referred to as 'knowledge politics' that transform sometimes relatively weak evidence into persuasive narratives to gain both political and financial support often driven by 'champions of the cause'. This is part of the communication and constituency building for public awareness. Whitfield et al (2015) provide a good example of this with respect to the SLM practice of conservation agriculture and caution that critical reflection is needed when 'bandwagons' are created that drive the promotion of interventions. Here science has a major role to play in understanding under what contexts (biophysical, socio-economic, cultural, political, financial, etc.) a particular SLM option is likely to be adopted and scaled up. Such an analyses can achieve better results and avoid disappointments often associated when development projects run their course with the lack of follow up resulting in the discontinuation of interventions that are meant to be self-sustaining

The roles of interacting and inter-connected agencies assumes increasing importance in this regard (Step 7) emphasizing where roles can be allocated and/or shared amongst the participating actors, (farmers, NGO's extension agencies, government agencies, private sector, donors, research organizations). Such interactions however are needed from steps 4-7. Step 7 is particularly relevant to address so called 'wicked problems' such as land degradation that require a broad network of agencies including research institutes, government and non-government organizations, civil society organizations and the private sector. These agencies play different roles from promoting the intervention or innovation to acting as brokers that bring agencies together and form networks, change institutional arrangements and help raise the resources required (see Hermans et al 2013 and references therein for further discussion on roles and functions of these agents). The dissemination strategy should ensure alignment with larger scale initiatives such as the UNCCD National Action Programmes. Missing often in programs and projects to introduce SLM options are adequate process of monitoring and evaluation that give feedback to all actors, that encourage more innovation platforms or other arrangements and that allow space for changes and introductions of new or alternative options into the

framework (Step 8). The role that multi-stakeholder mechanisms play and their increasing importance in achieving scaling up is well recognized in this framework. The advantage of multi-stakeholder arrangements is that they can be vehicles for further adaptation and innovation that move beyond a simple scaling out of a particular intervention. Further discussions are available from Wigboldus and Leeuwis, (2013).

6 Conclusion

This paper has reviewed the state-of-the-art with respect to scaling up successful SLM practices drawing on information from the literature and the practical experience from a range of experts in the field. Scaling up requires coordinated planning and multi-stakeholder engagement across scales and sectors. Each separate SLM practice or intervention needs to be linked with the efforts and framework being promoted to achieve land degradation neutrality at local and national-scale. Linkages or nodes that bring the different levels together are key to successful scaling via knowledge exchange and learning processes. Often the promoter of a technology requires another actor to foster collaboration between the different agencies and networks, acting as knowledge brokers or champions. A guiding framework for achieving the scaling up of SLM options was developed based on an eight step iterative process, to complement work being done by the UNCCD to achieve land degradation neutrality under the Sustainable Development Goals (UNCCD, 2016). The framework provides guidance to those seeking to achieve SLM at international scales by systematically understanding the contexts in which there is evidence that specific SLM interventions can be scaled up and out, so that scalable SLM options can be screened and adapted to these contexts, piloted and disseminated.

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