

GLOBAL LAND OUTLOOK WORKING PAPER

SCALING UP SUSTAINABLE LAND MANAGEMENT AND RESTORATION OF DEGRADED LAND

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SUMMARY

With current rates of land degradation reaching ten to twelve million ha per year, there is an urgent need to scale up and out successful, profitable and resource-efficient sustainable land management practices to maintain the health and resilience of the land that humans depend on. As much as 500 million out of two billion ha of degraded land, mainly in developing countries, have restoration potential, offering an immediate target for restoration and rehabilitation initiatives.¹ In the past, piecemeal approaches to achieving sustainable land management have had limited impact. To achieve the ambitious goals of alleviating poverty, securing food and water supplies, and protecting the natural resource base, we need to recognize the inter-connectedness of the factors driving land degradation, so that solutions can be taken to scale, transforming management practices for millions of land users. An analysis of the critical barriers and incentives to achieve scaling up suggests that the most appropriate options should be selected through the involvement of stakeholders at all levels, from local to national and international. New incentives for land managers as well as the public and private sectors are required to achieve a land degradation-neutral world.

1. INTRODUCTION

Both developing and developed countries are facing the inter-connected challenges of population growth and migration, climate change, biodiversity loss, and degrading land and water resources. We have entered an era where our thirst for material growth is placing extreme pressures on our land resources, threatening ecosystem collapse.² We need to recognize this inter-connectedness more widely and rapidly to take solutions to scale, transforming land management practices for millions of land users. With current rates of land degradation of as much as ten to twelve million ha per year and the fact that there is a need to increase terrestrial food production by some 70 per cent by 2050 to satisfy demands of a growing population,³ there is an urgent need to scale up and out successful, profitable and resource-efficient sustainable land management (SLM) practices to preserve the natural

resource base that humans depend on for their survival. As much as 500 million out of two billion ha of degraded land has the potential for restoration – mainly in developing countries.¹ There is increased recognition that both the public and the private sectors need to work together with land users to bring about the transformation in land use and management needed to achieve the goals of land restoration.⁴

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 watersheds⁵ 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.⁶

It is now well recognized that the concept of SLM is a unifying theme for global efforts to combat desertification, drought and land degradation, climate change and the loss of biodiversity.⁷ SLM combines technologies, policies and practices aimed at integrating socio-economic principles with environmental concerns that maintain or enhance production and ecosystem services, reduce the level of production risks, are economically viable, socially acceptable and protect natural resources.⁸

This working paper examines how SLM can be scaled up and out globally. Scaling up and out generally 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.”⁹ Institutional changes – both within donor and development organizations as well as initiated by policy makers – are needed to create an enabling environment that can promote scaling out via the adoption of SLM practices from farmer to farmer, and community to community.¹⁰ First, the key elements that explain how and why SLM policies and practices are adopted institutionally and on the ground were identified from the literature on the theoretical and operational frameworks for scaling up and out. Then, barriers and success factors are considered, identifying seven principles for successfully scaling SLM up and out. Incentives for the private, farming and policy communities to scale up SLM are proposed. Finally, the paper presents a practical framework for scaling SLM up and out to reverse land degradation and help meet Sustainable Development Goal (SDG) target 15.3 and the objectives of UNCCD to achieve land degradation neutrality and promote sustainable land management.¹¹ The essence of this framework is presented in Part Three of the Global Land Outlook.

2. FACTORS TO CONSIDER FOR SCALING UP AND OUT

There are a range of factors that influence the adoption of innovations,¹²⁻¹⁵ which can be summarized as:

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

2. Internal, individual factors, including attitudes, values and beliefs related to the environment, compared to other competing non-environmental motives, personal capabilities (for example, knowledge and skills, disabilities), resources (such as 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 individual action.

Existing operational frameworks for scaling up have the following common elements:

- Identification of a successful intervention, defining what is to be scaled up, usually either a technology, a process or organizational innovation
- Selection of a scaling up method from the range available
- Development of a vision and assessment of the scalability of an intervention or innovation through a diagnosis that includes all actors or stakeholders, is interactive, multi-disciplinary, and multi-sectoral
- Identification of barriers or constraints to scaling and ways to remove them, perhaps using a theory of change process that results in a favorable enabling environment
- Development of a communication and constituency-building process for increasing public and stakeholder awareness and collaboration, and
- Tracking of performance through a monitoring and evaluation process that also helps to quickly identify bottlenecks and suggest course changes in the process and provide feedback for modifications and innovations.

When barriers or constraints are being considered for scaling up, Sumberg¹⁶ suggests clearly separating endogenous manageable constraints (for a potential user of an innovation) from prerequisite conditions (that are exogenous). Endogenous constraints include whether or not there is a requirement or demand for the innovation and that it be profitable and reliable within a management and environmental range that is acceptable to the potential

adopters. Prerequisite or exogenous constraints include required inputs such as land, labor, capital, seeds, fertilizer, agro-chemicals, as well as information on how to use them together with favorable policies and organizational or institutional capacities that support better coordination. While all these conditions need to be met for adoption, it is only the endogenous constraints that should be specifically targeted during project/program design and implementation, as these can be most easily modified. Exogenous constraints are normally outside the control of the innovation project/program and must be addressed before adoption or scaling up can be expected.

3. BARRIERS AND SUCCESS FACTORS FOR SCALING UP AND OUT

Barriers and success factors in scaling up can be identified at the levels of farmers or 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. The scaling up process should adapt to these¹⁷ and not get entangled in the seemingly endless complexity of socio-ecological systems. Key barriers to scaling up and out include a lack of:

- Technical options for the specific need and context being considered and/or awareness of these options 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, as well as the aversion of private sector investments in smallholders
- Political will to address problems in marginal areas
- Awareness of innovative approaches to incentivize SLM, such as payments for ecosystem services and insurance schemes

Additional barriers include:

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

From an analysis of existing frameworks and barriers, seven critical success factors are derived that can be integrated into scaling up strategies. These factors are considered below.

3.1 Plan adaptively and fund consistently

The majority of SLM interventions to date have been conducted at case study or pilot scales, ranging from villages to water basins and landscapes. Limited understanding of the replicability of SLM in ecological and socio-cultural contexts that differ from the original contexts where the options were developed, and of adoption processes at national and international scales, makes it difficult to design scaling.

Planning for success at scale requires a combination of top-down approaches via national and international policy processes, such as UNCCD National Action Plans, its voluntary programme on Land Degradation Neutrality, and other bottom-up approaches via local stakeholder networks. Setting clear milestones that relate to scaling via a well-defined theory of change and impact pathway helps bring divergent views and options together, further cementing a joint understanding and vision of the objectives of scaling up.

Scaling SLM up and out requires consistent funding, and to overcome this constraint, it may be necessary to consider alternative funding models and approaches to scaling up, for example:

- Payments for Ecosystem Services schemes may promote upscaling of SLM technologies that deliver measurable improvements in climate change mitigation (for example, carbon sequestration and storage), water quality and biodiversity benefits. In privately financed schemes, upscaling may prioritize locations or systems where tangible 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. Ideally, these different aims need to be brought together to develop a solid investment case for public-private partnerships at the landscape scale
- International donors each have different priorities, which will influence the selection of SLM technologies and approaches likely to be promoted in upscaling
- Table 1 and Appendix I highlight various examples of SLM being promoted, such as 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 interests¹⁸ from multinational corporations could 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 in turn prioritize SLM options that provide clear and measurable environmental sustainability outcomes.¹⁹ 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

The costs of restoring degraded land are estimated to be in the billions of dollars, far greater than is available from public funds.²⁰ Furthermore, achieving land degradation neutrality requires a longer-term commitment to funding that is often unavailable from development funds and the private sector. In addition, much of the benefits of SLM may be public goods, such as water regulation or job creation, making it difficult for private sector funding. Nevertheless, the involvement of the private sector is a must and private-public partnerships offer a way to overcome many of these problems.

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

There are many types of evidence that can be used to select the most relevant SLM options for scaling up and out. Economic evidence is key to convincing both policy makers and land managers to invest and re-direct policy and practice towards successful SLM options. Establishing the economic value of land and the benefits of restoration and sustainable management can help position SLM as a compelling priority within other development needs. For a more detailed discussion of the economic aspects, we refer to the publications from the Economics of Land Degradation initiative²¹ and its webpages at www.eld-initiative.org.

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. A range of non-monetary valuation techniques has been developed to capture collective meanings and significance ascribed to natural environments. These techniques often use participatory and deliberative modes to include multiple perspectives and dimensions of value.²²

Taking this more pluralistic approach to the benefits 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.²³ In studies on the success of payment for ecosystem service schemes, Posner et al.²⁴ suggest that it is the legitimacy of evidence and knowledge (when perception is unbiased and representative of multiple points of view) rather than its

credibility or salience that tends to carry more weight with decision makers. Decision makers must consider moral and ideological arguments alongside practicalities (such as budget constraints and employment opportunities) and unpredictable external events that constantly change the parameters of the decision being made.

3.3 Identify and engage 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. This will ensure that SLM technologies and approaches are socially and culturally appropriate when applied beyond the context they were developed in. As a result, SLM technologies and approaches are increasingly being developed in cooperation with land managers and other stakeholders to ensure that they are well-adapted to local needs.

There is a number of steps needed to successfully integrate stakeholder engagement into the upscaling process. The first 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.²⁵ By identifying stakeholders at nested spatial scales, it is possible to identify trade-offs arising from the adoption of certain SLM options for different groups, for example, impacts of irrigation for downstream water users. Once trade-offs have been identified, it is possible to facilitate a benefit-sharing dialogue between affected stakeholders to manage conflict and mitigate the worst negative effects.

Equally important is engagement at the highest possible levels with the policy community, from junior and senior civil servants to government ministers. SLM scaling must be linked to national policy priorities and initiatives to pursue a more coordinated mobilization and use of financial resources at the scales necessary to upscale SLM nationally. 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). Upscaling SLM also involves a process of social innovation, and care must be taken to avoid elite capture and dominance of particular groups that can bias

outcomes.²⁶ Based on empirical evidence from participatory SLM processes around the world,²⁷ three distinct principles emerge to ensure effective stakeholder engagement in SLM:

- Represent all the relevant stakeholders
- Employ a professional facilitator to help manage power dynamics between stakeholders, and
- Equip stakeholders with information and decision-making power so they can meaningfully participate in the scaling process

Evidence from various sources^{17,28} suggests that trust building sometimes requires long periods of time, yet is essential for success. This can present difficulties when projects are short-term, resulting in the withdrawal of support and staff when a project ends. The inability to maintain a long-term commitment can act as a significant barrier to scaling up.

3.4 Build capacity for scaling up and out

The ways and means to scale up SLM practices require capacity building across all scales, from farmers and private sector to national and international policy makers. Once a decision is taken that an intervention indeed has scope for scaling up, the limits or boundaries need to be defined, for example, a watershed, national or international scale. As interventions are contextual, it is the principals of scaling that need dissemination rather than the specific options considered for a particular context. Similarly, as scaling up can often take more than ten years, it is important to put in place the institutional capacity and incentives that go beyond individuals who may not be able to commit long-term. Governments can establish capacity-building programs that match their interests and priorities, such as demonstrated in the CASCAPE project in Ethiopia. Supported by the Netherlands and part of its Agricultural Growth Program of Ethiopia, CASCAPE or Capacity Building for Scaling Up of Evidence-based Best Practices aims to strengthen the capacity of stakeholders to scale up best practices for improving agricultural production.²⁹

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

More often than not, there is a need to identify and engage a champion from one or more actor groups who can lead and connect different interests. This can be an enthusiastic NGO leader, member of a farmer group, politician, financier, or a research team leader.

In addition, the following factors are important:

- Develop an influencing strategy to engage key policy stakeholders, working where necessary with high-level intermediaries to build momentum for policy change
- Work with opinion leaders, champions and influential organizations (from local to national, using traditional, customary or innovative approaches) to foster leadership, vision and values that can support scaling up and out

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

Scaling up and out processes can require sustained inputs from a range of stakeholders including land managers, NGOs, the research and business communities, donor and policy makers. To both mobilize and retain stakeholder engagement, it is necessary to provide tangible, short-term benefits that generate meaningful value for those involved. Section 4 will consider a number of ways in which each of these groups can be motivated to support and engage in activities to scale SLM up and out. In addition to incentives, it is important to identify disincentives, subsidies or

perverse incentives that may slow the pace at which SLM can be scaled or lead to disengagement from stakeholders.

3.7 Monitor, evaluate and communicate

Finally, it is essential to learn from both successes and failures to develop best practices 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 livelihoods.

The UNCCD's 1st Scientific Conference proposed a knowledge-management framework for SLM that involved the participatory development of indicators,³⁰ some of which have been proposed to monitor progress towards the SDGs. Such monitoring approaches do more than simply provide a measure of progress. They facilitate learning among different stakeholder groups across scales, and if designed and implemented in collaboration with stakeholders, they can enable continuous learning to improve SLM practices and ensure more effective scaling up and out. Table 1 illustrates the success factors in four selected case studies, while Appendix I presents these and other case studies in more detail.

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 programme to a cumulative budget of \$77 after nine 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 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 seven groups for trout 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.Mobilize: 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 SLM practices	

4. INCENTIVES FOR SCALING UP

Incentives aimed at scaling up SLM need to be designed based on a thorough diagnostic of stakeholder needs, their local or traditional knowledge, and a critical appraisal of existing incentives and their impacts, both positive (enabling) and negative (perverse). Generally, incentives are not harmonized to encourage multiple benefits and are sometimes conflicting (for example, agricultural subsidies that encourage overproduction through intensification, but that results in greater environmental damage from land degradation and nutrient pollution). For SLM, 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. Knowledge exchange between land practitioners and the research community on the drivers of land degradation and available amelioration practices for land restoration can act as an incentive for smallholders to adopt innovative approaches if the pre-conditions outlined earlier are met.

4.1 Private sector incentives

With few exceptions, the private sector and especially large multinational agricultural conglomerates have yet to exploit the provision of SLM inputs, technologies, market chains and other products and services for smallholder farms. Yet this sector, which produces much of the world's food – for example, 70-80 percent in Asia and Africa – will play a key role in meeting the challenge of feeding the rapidly growing world population. The reasons for the limited involvement of the private sector in advancing SLM approaches include lack of financing, inhibitory laws and regulations, weak distribution channels and insufficient labor.³² New technology services and payment schemes have been identified as the primary opportunities for private sector involvement. They include more accurate location analyses, such as road infrastructure, cellular phone coverage, Internet presence, access to credit, 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, vegetation trends, markets, and risks that can help target SLM practices.

Advances in the private sector development of new Information & Communication Technologies (ICT), such as advanced soil and water sensors and monitoring equipment, will allow farmers to monitor soils and crops more effectively, thus building on their abilities to use resources efficiently. These technologies are likely to be central to farmers of the future, including smallholders,

and should appeal to young farmers who already use ICT. Thus, not only efficiencies can be improved, but social benefits also gained through increased interest in farming and business development in rural and peri-urban environments, along with increased financial advantages.³³ The private sector can target existing retailers rather than smallholders, directly allowing them to improve their distribution channels and access information held predominantly by the public sector when given the right incentives. One target could be retailers, who not only sell products, but who can also offer advisory or extension services that governments are unable to provide. Thus, coupled packages of products and advice can offer greater growth opportunities, especially in areas where digital and advisory capacities are poor. Hubs of new economic activities in small to medium-size towns^{34,35} may offer the required scales to attract the private sector and create jobs in the agricultural and rural service sectors. The provision of information, better management and higher productivity would increase trust and customer loyalty.

Innovative payment methods will also help attract the private sector. Awareness, advantage, affordability and access have been identified as key determinants for adoption and scaling.³⁶ 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.³⁷ Much can be learned from the general retail sector and how to apply this to smallholder farmers and the promotion of SLM.

Private sector flexibility in the timing of sales can greatly help smallholders with sales of input vouchers for seeds and fertilizers, which can significantly increase land use and productivity.³⁸ Mobile banking can also help put vast amounts of remittances from abroad to better use by eliminating high interest rates on international transfers that other banking methods require.

Retailers, smallholders and entrepreneurs can help by becoming involved in multiple services via cloud sourcing and e-commerce related to weather forecasts, insurance, crop purchasing prices in different markets, soil maps, recommended crops and location-specific varieties, water availability, interactive mobile applications and videos on crop, pest and disease management. The dissemination of farming practices can be promoted by farmers themselves through activities such as Digital Green,³⁹ creating greater demand for products and services.

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 minimizing the risk for investments in land-based projects by providing guarantees from the public sector if projects fail or by offering tax allowances for investing in restoration projects.⁴⁰ This requires working with finance experts to de-risk restoration investments by considering both private and public investments. In addition, new methods of raising finance need to be explored to support scaling up, such as bundling private sector income streams with public goods. This could involve combining non-timber forest products with public goods such as reliable water supplies.

Most of these opportunities will require innovative partnerships, greater collaboration and connectivity among stakeholders together with technological innovations spanning 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.⁴¹ As profit margins are generally smaller in agriculture, there is increased interest from the private sector in scaling up and out that can stimulate profit-generating partnerships. Major NGOs such as Oxfam can take a lead in creating an enabling environment for greater engagement of the private sector with smallholders via innovative partnerships in sustainable food production.⁴²

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 to reduce their costs for inputs. However, the number of farmers that achieve these benefits is generally small, as these changes are not without costs for labor and inputs, such as agrochemicals and machinery. Engaging with innovative farmers is probably one of the quickest ways to promote novel approaches. The factors that determine whether or not a farmer can or is willing to innovate include their age, experience, personality, wealth status, whether they have been previously exposed to innovation and are involved in integrated farm systems.⁴³ There is a need to design incentives that encourage farmers and allow the innovators to flourish. As part of a general strategy to engage stakeholders⁴⁴ there is a number of processes that can encourage innovation and the testing of interventions. Farmer field schools⁴⁵ and farmer competitions can, for example, bring prestige and strengthen cultural identities, thus enabling greater knowledge exchange and learning.

4.3 Incentives for policy makers to promote scaling

More than anything, policy makers require practical solutions that are not only relevant to a broad range of stakeholders, but also create a legacy of actions and a vision of what the future of the environment can be if SLM practices are upscaled.

Policy makers will likely respond more readily to evidence that the implementation and scaling up of SLM practices will contribute to more pressing challenges, such as unemployment, migration, food security in fragile states, and the assurance of future capacities of natural resources to provide goods and services for society. Equally important is evidence that the neglect or over-exploitation of land resources will result in increasing scarcities of food, water and employment.

Sound business cases are required for the implementation of SLM practices to generate multiple benefits such as job creation, higher incomes, improved productivity and the provision of other ecosystem services, including opportunities for eco-tourism and the preservation of cultural identity related to the natural environment. SLM needs to appeal to the interests of multiple sectors that can benefit from good land management practices and are also affected by the negative impact of poor land management on agriculture, environment, water and energy.

5. A NEW FRAMEWORK FOR SCALING UP SLM OPTIONS TO REVERSE LAND DEGRADATION

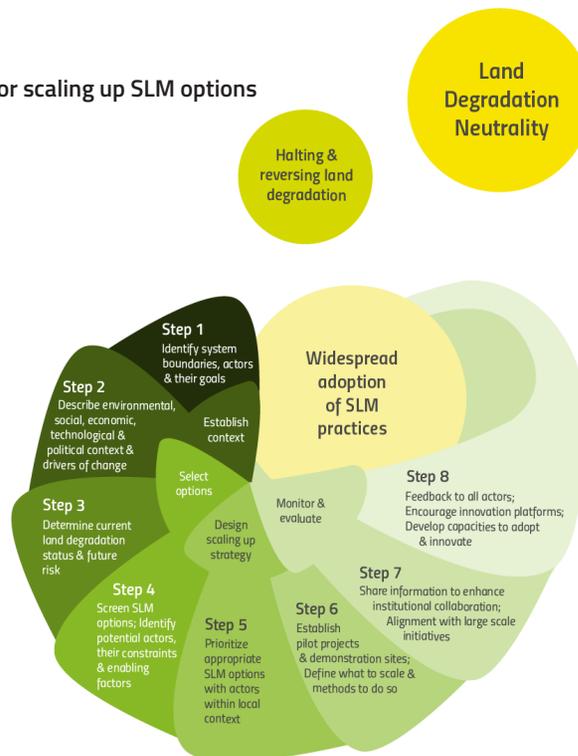
Figure 1 below outlines the eight steps of a proposed framework for scaling up. Step 1 determines the scope of scaling at the outset, setting the boundaries as either biophysical or administrative. Through an inclusive process that engages all actors, a thorough diagnosis of the cultural, social, economic, technological, political and environmental context and the main drivers of change are identified (Step 2). Using the indicators proposed by the UNCCD and others,^{11,46} the baseline state of land condition 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 and benefits, social and cultural acceptance, the identification of potential adopters, their constraints and prerequisite conditions (Step 4). A parallel process ensures that the potential SLM options are appropriate in the context and constraints of the adopters (Step 5). Next on the ground, 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 for success, 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 scope 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.¹¹ The promotion of an innovation or intervention generally relies on evidence from this range but also on 'knowledge politics' that transform sometimes relatively weak evidence into persuasive narratives to gain both political and financial support, and which are often driven by 'champions of the cause'. This is part of the communication and constituency building for public awareness. Whitfield et al.⁴⁷ 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 can play a major role in helping to understand which contexts (biophysical, socio-economic, cultural, political and financial) a particular SLM option requires to be adopted and scaled up. This can help achieve better results and avoid disappointments often associated with development projects that were envisioned as self-sustaining and were later discontinued due to the lack of follow-through.

Interaction and inter-connectedness between participating agencies play an increasingly important role (Step 7), with the focus on efforts being effectively allocated and shared among participating actors (farmers, NGO's, extension and government agencies, private sector, donors and research organizations). Such interactions, however, are needed from steps 4-7. Step 7 is particularly relevant in addressing issues that require a broad network of agencies, including research institutions, government and non-government organizations, civil society organizations and the private sector. The 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.⁴⁸ A dissemination strategy should ensure alignment with larger scale initiatives, such as the UNCCD National Action Programmes. Often missing in SLM programs and projects is an adequate process of monitoring and evaluation that gives feedback to all actors, encourages more innovation platforms or other arrangements, and allows 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.

Figure 1: A framework for scaling up SLM options



6. CONCLUSION

In general, frameworks for achieving scaling up rely on the identification of a successful intervention and its scaling boundaries, selection of methods, a vision and assessment of the scalability of the intervention and barriers to implementation. From this, seven critical factors were identified for successful scaling up of SLM practices:

- i. Adaptively plan and consistently fund, combining top-down and bottom up approaches via stakeholder networks;
- ii. Select SLM options for scaling up based on best available evidence;
- iii. Identify and engage stakeholders at all scales
- iv. Build capacity for scaling up including how to establish and strengthen collaborative mechanisms
- v. Foster institutional leadership and policy change to support scaling up
- vi. Achieve early tangible benefits and incentives for as many stakeholders as possible, and
- vii. Monitor, evaluate and communicate

A range of incentives for farmers and their communities, policy makers and the private sector has been identified. Innovations for the public-private partnership sector include innovations in ICT and taking a fresh look at the role of retailers, their place in the value chains and potential to provide additional services, such as weather forecasting, insurances and pricing information, as well as other agricultural extension services.

Scaling up requires coordinated planning and multi-stakeholder engagement across scales and sectors. Each separate SLM practice or intervention needs to be linked to the efforts and framework that promote land degradation neutrality at the local and national scales. Linkages or nodes that bring different levels together are key to successful scaling up via knowledge exchange and learning processes. Often the promoter of a technology requires another actor to foster collaboration between different agencies and networks (champions). A guiding framework for achieving the scaling up of SLM options was developed based on an eight step iterative process. We believe this framework will complement the Land Degradation Neutrality Target Setting Programme (LDN TSP) that is being implemented by the UNCCD to achieve land degradation neutrality.

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8. ANNEX: CASE STUDIES

1. MOROCCO – NATIONAL OWNERSHIP AND MAINSTREAMING SLM

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The Challenge

A string of 180 oases lines up the South of Morocco in the provinces of Guelmim, Assa-Zag and Tata. Placed at the doorstep of the desert, these agro-ecosystems have vital ecological, economic and social importance and act as a natural barrier against desertification. The combined effects of climate change and recurrent droughts, aggravated by major socio-economic and institutional changes, make these oases today the theater of various processes of desertification and land degradation leading to loss, abandonment and migration – today, 430 000 inhabitants of South Morocco are affected by the desertification processes.

Initiative/best practice

“Programme Oasis Sud” (POS) was launched in 2006 to address these challenges. Designed initially on a modest scale – for example, USD 3 million in the oasis of Tata – the POS has evolved into an integrated program that supports local development planning, value chain development, sustainable land management and women empowerment. The scaling-out strategy of the POS was integrated in its design. In line with the country’s policies for strategic planning, the POS adopted Community Development Plans (CDPs – for example, *district or municipal development plans*, “*Plan Communaux de Développement*” in French) as the main tool for participatory planning and implementation of development interventions. The POS followed bottom-up, collaborative approaches and mobilized a wide variety of development actors from the local to the national level. In the first phase, during the design of CDPs, a comprehensive territorial diagnosis is conducted with the strong involvement of local communities to best capture their perspectives regarding development needs and opportunities. Based on this territorial diagnosis, a framework for local development is prepared. Thematic,

issue-based workshops bring together representatives of decentralized departments of relevant institutions, municipalities and local authorities, NGOs, community leaders and thematic specialists. The CDP is then approved by the Commune Council and becomes the framework document driving the local development process. Funding from national budgets is then allocated for approved CDPs which also represent an effective tool for mobilizing resources from donors and the private sector. Inter-communality or collaboration between Communes is facilitated to promote synergy and efficiency.

Category of best practice

Policy/ Governance

Key outcome/insight/interesting fact

The elaboration and financing of district development plans for 46 communities is probably the most spectacular result of POS capacity to scale up sustainable development efforts, including sustainable land management on a large scale. Cluster des Oasis du Sahara (COS) was established as a viable public-private partnership to bring together small farmers and support the production, value-adding and marketing of agro-food products. Today it channels products from 70 cooperatives and has established the “Cactopole” – a hub for processing, value-adding and marketing cactus products, which became the leading economic resource in the area.

Impact

The combined budget of the POS reached USD 77 million in 2015, mostly from national resources. About 5 500 jobs have been created and sustainable land management practices have been promoted across a vast territory that includes 11 urban municipalities and 45 rural districts. The implemented measures include promotion of sustainable land management practices across 195 000 ha of agricultural land; improved management and restoration of over 10,000 ha of ancestral cacti plantations; promotion of sustainable water management including reviving traditional knowledge and customary practices of water allocation and the rehabilitation of khetaras (traditional system that channels water to the palm grove) as well as erosion control and sand dune fixation in 20 oases.

Figure 1: Oases in Morocco and women working on cactus products.



Lessons learned

- Ownership – local and national – of the development intervention is key to the success of upscaling efforts;
- Critical success factors include:
 - i. the adoption of the Community Development Plan (CDP) as the main tool for planning, financing and implementing SLM interventions, which are relevant to local development needs and are aligned with national and regional development policies and priorities, thus facilitating their integration into national planning and budgeting frameworks
 - ii. the establishment of central structures to support value adding and marketing of local products, enhancing livelihoods and promoting a sustainable livelihood-based approach to SLM
- Main challenge was the need for a strategic socio-economic vision to guide the development of CDPs. In the case of land, *future/updated CPDs can be guided by SDG Target 15.3 on “combating desertification, sustainably managing land and restoring degraded land.”*

2. RAPID RESTORATION OF HEAVILY DEGRADED FARMLAND WITHIN PROJECT WADI ATTIR

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The challenge

The arid and semi-arid interface in the Northern Negev is seriously affected by degradation, leaving little room for improving the prospects for traditional agricultural activities of the local Bedouin communities. Project Wadi Attir has been designed to develop sustainable land management technologies based on traditional Bedouin knowledge, combined with in-depth understanding of the science of land degradation and restoration through various methods tested during the last 25 years, including planting

of appropriate tree species¹, manure application and temporarily reduced grazing².

Initiative/best practice

Perennial plant cover established on formerly heavily eroded gullies and slopes, composed of agroforestry tree species in combination with native dryland tree and shrubs varieties were restored by conservation, planting, and erosion control measures, as well as construction of water catchments and terraces³. Selected nectar and nitrogen-fixing soil-improving tree species were also planted for watershed protection, windbreak, food, fodder and wood production, soil improvement and erosion control. The protection of major biodiversity hotspots was enforced, and grazing was temporarily prohibited to stimulate the rapid recovery of annual vegetation.

Impact

Within four years, there has been a dramatic increase in biological productivity as well as diversity of plant and animal species, with the site providing significant outputs of food, fodder, wood and honey earlier than anticipated, displaying rapidly progressing soil improvement and biological productivity. Simultaneously, the number of rare plants and animals has increased rapidly in selected areas enriched by thousands of reintroduced native trees and shrubs. The overall impact and underlying scientific principles are described here: (<http://www.sustainabilitylabs.org/ecosystem-restoration/>).

Category of best practice

The ecosystem restoration efforts described here were part of Project Wadi Attir, an initiative that has established a model sustainable agricultural operation and regional educational center on 35 hectares, demonstrating a holistic, integrated approach to sustainable development in an arid eco-zone. The project has been proposed by

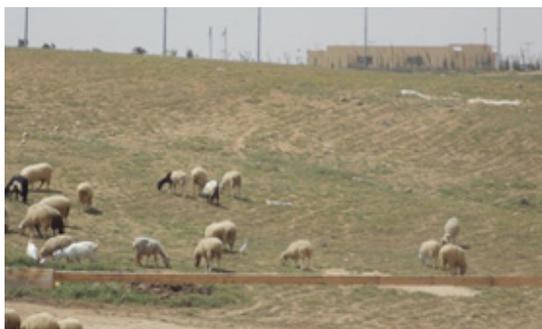


Figure 2: Application of scientific principles acquired over 20 years of soil and agroforestry research in the Northern Negev for restoration of highly degraded dry farmland. The picture on the left shows the degraded land just outside of Project Wadi Attir in 2012, the picture on the right shows the project area in 2016, restored through watershed protection, soil and biodiversity conservation and agroforestry measures. This dramatically illustrates the productivity potential lost across huge areas of degraded dryland areas in Southern Israel and worldwide due to dryland degradation.

The Sustainability Laboratory together with the Hura Municipal Council of a local Bedouin township. The detailed implementation plan has been developed by a task force of scientists from Ben Gurion University with the assistance of private consultants, financed by donations and government support, making this project a model multi-sector, multi-stakeholder effort for large scale sustainable dryland restoration. Out of 25 hectares dedicated to irrigated feed production, about 15 hectares became the subject to soil conservation, ecosystem restoration and agroforestry approaches. Consequently, the best practice applied in this project can be considered a test case for integrated approaches towards sustainable development of large degraded dryland areas, delivering far-reaching economic and environmental benefits to vulnerable dryland communities.

Lessons learned

These results demonstrate that technical challenges towards rapid ecosystem restoration and soil improvements in degraded drylands can be quickly and successfully overcome while developing community-based economic innovation and development, as previously forecasted^{4,5}. Similarly, significant progress has been achieved in simplifying the restoration technologies to achieve rapid recovery under reduced costs. Overall, the development of Project Wadi Attir has provided valuable technical insights and helped establish local and institutional contacts that are expected to facilitate further upscaling activities. For future upscaling in the Israeli context, the following key challenges remain to be addressed:

- Finding suitable land areas that are not subject to ownership disputes or otherwise bound;
- Identifying communities willing to engage in long-term sustainable management practices
- Defining and initiating adequate profit-oriented approaches to add value to expected project results, such as enhanced farm outputs or ecotourism, and explore accompanying business models and marketing opportunities
- Overcoming bureaucratic hurdles more rapidly to achieve efficient implementation of the project

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3. COMMUNITY LED SOLUTIONS FOR SUSTAINABLE LAND MANAGEMENT IN WESTERN RAJASTHAN IN INDIA

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The Challenge

The resilience of the communities living in dryland regions has been strongly compromised by unsustainable land management practices, such as continuous cropping without fertility and organic matter augmentation, losses in the perennial component, overgrazing, neglect of soil and lack of water conservation. For example in India, large areas of semi-arid and arid land are affected by accelerating resource degradation, which is further exacerbated by increasing population pressure, climate change and the weakening of local institutions. In the state of Rajasthan alone, a population of 40 million makes their living from agriculture, and the poor smallholder farmers are the ones who bear the brunt of social and environmental costs of degradation and reduced resilience. The starting point for the interventions described here was the acknowledgement that any effort addressing land management needs to consider the agro-ecosystem as a whole, and take into account capacity constraints, weak policies and institutions and the available methods of transmitting scientific knowledge. The guiding principle of the interventions has been restoring productivity and profitability of degraded lands and maximizing the potential of limited land resources available to smallholder farmers by creating incentives for stakeholders to invest in sustainable land management.

Initiative/best practice

Under the CGAIR Research Program on Dryland Systems, ICRISAT in cooperation with several partners has applied an integrated systems approach to sustainable land management (SLM) in different arid and semi-arid regions of India. Here, we discuss a specific case study of western Rajasthan, covering the most vulnerable arid districts of Jodhpur, Barmer and Jaisalmer. The approach considered the involvement of communities and appropriate institutions as an integral part of the strategy to restore the degraded land, provide farmers and pastoralists with sustainable income, improve their livelihoods and secure the productivity of land in the future. The project focused on private and common lands (in particular common pastures), and the integrated approach to management of

both types of land resources. The following key solutions have become the priority:

- Drought-proofing that involves traditional drought-coping strategies, climate-ready cultivars, soil and water conservation, integration of economically important perennials and institutional interventions
- Sustainable management of community silvo-pasture systems (including inclusive by-laws and their social enforcement)
- Rainwater harvesting and its efficient utilization for high-value commodities
- Agricultural diversification through medicinal plants, small ruminants and increased market integration and inclusiveness of value chains
- Improved practices to increase resource-use efficiency by using information on climate, soil, water and labor availability and markets
- Critical for upscaling was the acknowledgement of diversity within communities and agro-ecosystems. Household characterization was used to define homogenous typologies, which helped to understand the potential, as well as expectations and requirements of stakeholders and accordingly target SLM interventions. Ex-ante quantitative and participatory tools also helped in prioritizing and better targeting landscape and farm-type specific potential interventions

The participatory approach was facilitated by creating regional multi-stakeholder innovation platforms (IP), village development committees (VDCs) and commodity-specific sub-committees for women. IP members included local NARES, NGOs, private industry, CG centers and farmers. Each VDC had ten to fifteen members representing diverse groups of crop and livestock farmers in the village, including women and marginal farmers. IPs and VDCs played a key role in building local capacity and were used for the identification of major constraints, possible solutions, their prioritization and implementation at the district, village and hamlet levels. The IPs and VDCs also provided feedback on SLM practices as part of an iterative process that allowed for adjusting strategy as well as choice of interventions and outputs. This also reflects the ambition that the VDCs and IPs become continuing structures independent from project support. Across the whole value chain, the community implemented the above-mentioned context-specific interventions at the landscape and farm level to promote integrated crop—tree—livestock farming systems. A commodity-specific innovation platform has also been successfully established to promote cultivation of high-value native medicinal plants and market integration. At the same time, IP involvement, field visits and individual discussions on necessary policy adjustments have been

successfully used to create awareness of SLM issues among various policy actors. This approach has been successfully piloted in more than 50 villages by the project partners and IP members with funding provided by the government, as well as corporate and international donors.

Category of best practice

Farmers, governance and the private sector

Key outcome/insight/interesting fact

The key factors that have enabled adoption of integrated systems approach and co-designing profitable farming systems targeting SLM were:

- Participatory agro-ecosystem analysis that helped secure farmers' cooperation in co-designing resilient and profitable farming systems
- Wider stakeholder participation and integration of local preferences and knowledge in prioritizing potential interventions
- Targeting SLM interventions that can be customized for local and potential markets and have significant income potential
- Undertaking evidence-based ex-ante analysis of potential SLM options and sharing it with stakeholders to assure acceptance of new interventions
- Allowing sufficient time for stakeholders to assimilate new understanding and self-organize to implement a systems approach
- Building farmers' confidence in adopting and implementing SLM interventions through increased understanding of the functioning of agro-ecosystems, their interlinked components and potential interventions
- Enabling farmers to find collective solutions for social problems beyond the agricultural sphere by building capacity to self-organize through VDCs and IPs.

Impact

- The approach triggered a broad participation of stakeholders in project implementation. The participatory process implemented through IPs and VDCs strengthened and promoted the development of farmers' and other stakeholders' capacity to innovate. It also facilitated self-organization among stakeholders and institutional mechanisms to achieve equitable distribution of benefits and ensure higher adoption of the solutions and their post-project sustainability
- The integrated resources management with a focus on enhancing farm income and resilience resulted in increased millets and legume yields by 12 – 150 per cent and common pasture productivity has increased 2.5 to 4 times

- Farm income from rainfed poor soils has doubled with the farm type-specific integration of medicinal plants with linkage to industry for buy back
- Improved small ruminant value chains resulted in increased productivity and price realization by 25 – 30 per cent
- The increased income from the degraded land has motivated the farmers to make bigger investments in sustainable land management
- Awareness-raising efforts as part of the integrated systems approach to SLM has influenced the ministry of Ayurveda and traditional medicines of government of Rajasthan to propose the recommended medicinal plant (shankhpushpi) as the focus of their support program



Figure 3: Landscape-to-farm-level SLM interventions as part of integrated systems approach

Lessons Learned

What did you learn in this process?

- Integrated approach is crucial to upscaling SLM within communities and agro-ecosystems
- Ex-ante analysis on potential benefits of SLM and long-term view on benefits of SLM are instrumental to ensuring cooperation of stakeholders in implementation of interventions
- The efforts towards SLM need to be linked directly to the income increase of households. The framework for SLM should encourage cooperation between stakeholders and target-improved value chains

What were the critical factors of success?

- Participatory identification and prioritization of context-specific SLM solutions
- Ex-ante analysis of economic benefits offered by SLM solutions to motivate farmers
- Nurturing inclusive institutional mechanisms on levels from village to regional is crucial to building the capacity

of communities and stakeholders, successfully adopting SLM and improving livelihoods

- Aligning the integrated approach of SLM with existing development programs through IPs and evidence-based policy advocacy

What was difficult or challenging?

- The selection and combination of SLM interventions implemented in systems context are location-specific and require time to achieve tangible results. The multi-stakeholder development process requires significant investment of time and effort, creating challenges to the adoption of SLM interventions at scale.
- Interruptions in funding made it difficult to replicate and scale up the project's successes.

How did you overcome the challenges faced?

- Consultations with a broad range of stakeholders and the use of remote sensing and secondary data were useful in location-specific planning for upscaling
- Participatory agro-ecosystems analysis and knowledge-sharing with stakeholders on the potential benefits of proposed SLM interventions based on ex-ante analysis helped secure their cooperation in adopting SLM practices
- Regional IPs has played an important part in finalizing and upscaling context-specific SLM interventions
- Establishing participatory learning sites on farms has also been very useful

If you were to do a similar project in the future, what would you do differently?

- We would build the capacity of large number of development actors and extension agents by using developed locations as learning sites. We would also make an effort to ensure greater involvement of senior policy makers and private sector in the process and would pursue additional developmental funding opportunities to conduct additional research and collect more evidence on the advantages of SLM interventions.

4. A CASE STUDY OF VALUE CHAINS IN THE PERUVIAN ALTIPLANO: THE EXPERIENCE OF THE ALTAGRO PROJECT

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The Challenge

The Peruvian Altiplano is home to some of the world's poorest populations. High climatic variability, high altitude, land fragmentation and limited access to markets and financial resources affect highly diverse and complex potato-based farming and livelihood systems that include low-productivity livestock. Farmers are usually family smallholders who also share communal land and receive an average annual income of USD 517 (\pm 183) per capita per year. Food security and climate-related agricultural risks are the main challenges the farmers face.

Initiative

To improve farm productivity, secure livelihoods and build resilience of farming systems, an integrated systems approach was used with three activities selected to organize respective value chains: quinoa cropping, dairy farming and trout farming. A value chain in agriculture is defined as a set of innovations implemented in the route from production to market, aimed at increasing the quantity and quality of produce, the access to markets, the market price and the income of the farmer. Altogether, the project involved 100 rural communities, 2 114 families and 6 605 individuals. Best practices were selected based on climate, human and natural resources available in the region and the competitive advantages of production options. These were based on market opportunities, potential productivity, potential contribution to family income, potential contribution to smallholder's food security and nutrition, potential for the involvement of family members, and potential for women's empowerment through their participation in decision making, income generation and income distribution.

Biological and socio-economic baselines were established through a systematic survey in 2006. The sustainability of farming in a highly variable climate has been analyzed. To enhance the systems, other sources of income, such as handicrafts, were integrated into the household's livelihood systems.

Producers were encouraged to dedicate more resources to quinoa production, which used to be a low-priority crop intended mainly for self-consumption. A total of 1 175 families participated in the organic quinoa production program, which has received supervised credit support, as well as processing and marketing assistance. The project

has contributed to raising annual net family income from USD 72 in 2006 to USD 700 in 2010 – 2011 as a result of an increase in the area planted, higher yields and exports.

Before the project implementation, milk production was limited by feed shortages during the dry season as well as lack of value-added dairy products and weak markets. A total of 129 ha of alfalfa and 290 ha of forage oats have been introduced to provide additional feed and small silos were used to store feed for the dry season – enough to supplement 1 334 producing cows for almost half a year. Fourteen cheese factories, run by producers themselves, were organized and the dairy products were marketed locally. Increased production and sales raised annual dairy income per family from a baseline of USD 29 in 2006 to USD 767 by 2011. The cheese factories generated an average yearly income of USD 3 328 per participating family, showing the importance of value-added produce. Two of the fourteen cheese factories promoted by the project through a credit program are now building new plants with a better technical design.

Before the program started, trout farming was limited to only a few farms. The project organized 84 families in seven groups, and provided training and credit to start new trout farms. The groups planned and managed the production process, built the basic infrastructure, standardized the product, managed production costs and marketed their produce. Over five years (2006 – 2011), the farms produced 4421 tons of trout with a gross value exceeding USD eleven million. Annual income per participating family ranged from USD 784 to USD 7 788. The activity created between five to sixteen permanent jobs per year plus ten temporary jobs per month per producer. Women's participation was close to 48 per cent. The availability of credit was crucial to adoption of the interventions. The project provided credit through supervised revolving funds and technical assistance. A total of USD 172 226 was mobilized in 4.6 cycles of operation, with a repayment rate higher than 90 per cent. The average credit was USD 790 with average monthly interest rates of 2 per cent.

Category of best practices

Production technologies, value-adding processing of primary products, producers' organization for processing and marketing, credit supply and management, producers' training.

Key outcomes

Participants have learned the advantages of associated work, developed production and marketing skills, and gained self-reliance to control their own progress.

Impact

More than two thousand families moved out of poverty. Over the life of the project, participants' livelihood capital increased by an average of 60%.

Lessons learned

Organization of producers' groups, technical support, improved access to markets through value-added products, social participation, availability of credit for fostering investment in productive activities and livelihoods diversification have become critical factors promoting scaling up and out of innovations.

5. COST-EFFECTIVE LAND RESTORATION BY PRIVATIZATION AND ECONOMIC INCENTIVES

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The Challenge

The Northern Negev in Israel is located on the border between arid and semi-arid climate zones. Due to good soil quality, the area has been exploited for rain-fed field crops, grazing and agroforestry for thousands of years. Centuries of neglect and turmoil after the demise of the Byzantine Empire have left the area's ecosystems and farmlands profoundly degraded. Traditional land use and ownership were disrupted during the creation of the state of Israel, with land transformed to public rangeland, with intensive agriculture or forestry leaving a large area under disputed ownership tied down in courts until today. Traditional livestock management suffered gravely from deteriorating rangeland productivity and decreasing grazing areas in the face of inadequate grazing management, excessive land tilling and misguided forestry practices^{1,2}

Initiative /best practice

Private farms for mostly rain-fed extensive agriculture were created to achieve controlled and more sustainable management of open rangelands. Selected Jewish and Bedouin farmers were allocated 100-ha farms (mostly

on 50-year leases), in part on the condition to develop a detailed management proposal. Private initiatives coupled with scientific advice and ad hoc learning applied to two properties, Yattir Farm¹ and Abu Rabbia Farm³, allowed for inexpensive, rapid and effective restoration of biological productivity, range improvement⁴, and creation of enhanced grazing potential. Planting of olives and other fruit trees, medicinal plants and silvo-pastoral trees promoted watershed protection and soil conservation (Fig. 1), while creating significant economic potential, as well as restoring and conserving a significant biodiversity inventor¹.

Category of best practice

The applied practice is a classical top-down/bottom-up interaction, with private individual farmers responding to a government initiative taken in response to previous failed initiatives. The success was to a large extent facilitated by rapidly growing demand for alternative healthier and higher quality farm products, such as cheese, olive oil, medicinal plants and other fresh farm produce. The combination of good accessibility, short distances to the market and a new generation of well-educated motivated farmers willing to engage in new initiatives have also been conditions necessary for success.

Impact

The impact of improved farm management in relation to sustainable land management and economic development was significant on both farms. Soil recovery and terrace agroforestry reduce erosion and increase carbon sequestration into biomass and soil organic matter. Farm income grew due to higher fodder availability⁴, with additional revenues from olive oil and other agroforestry products³. Significant increase in biodiversity not only contributes to the resilience of ecosystems, but also offers a significant ecotourism potential¹.



Figure 4: Stone terraces across dry riverbeds at Abu Rabbia Farm create ideal conditions for olive and other agroforestry trees (left). Planted *Acacia victoriae* trees at Yattir Farm together with conservation management and manure application allowed range productivity to triple within 20 years (right).

Lessons Learned

The results of the initiative indicate that involving land owners directly can ensure rapid progress towards sustainable land management with very low costs. Unfortunately, a majority of other farm owners failed to achieve similar positive results. Since there have been no legal or financial incentives for land owners to engage in sustainable land management, they have mostly restricted their activities to property marking and subsistence farming activities. However, the excellent and well-documented recovery processes set in motion by a limited number of low-cost restoration measures described here make widespread application of privatization initiatives supported by adequate incentives a promising option for large-scale restoration of agro-ecological landscapes.

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6. GRAZING ENCLOSURES AS AN ENTRY POINT FOR LANDSCAPE REHABILITATION IN THE ETHIOPIAN HIGHLANDS

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The Challenge

In the highlands of Tigray region in Ethiopia, population growth, recurrent droughts, and increasing livestock densities have caused extensive degradation of communal lands. Livestock play several central roles in supporting livelihoods in the region, but grazing-induced soil erosion and compaction of communal lands create a threat to food security and incomes. Farm yields are also affected by drought, and since small-scale irrigation is an important source of alternative income, availability of water is a significant challenge in the region.

Initiative/best practice

One of the best-documented techniques for large-scale rehabilitation of communal lands in Tigray is the establishment of grazing enclosures. Enclosures are generally created to improve forage availability and to protect steep higher slopes and moist valley bottoms from degradation. Animals are excluded for all or part of the year (especially during the rainy season), with forage cut and removed from the enclosure during closed periods (Nedessa et al. 2005), with some exceptions made – in particular, for traction animals. Those enclosures on unproductive catchment slopes above croplands further increase infiltration and base flow to the croplands below, improving crop yields (Alemayehu et al. 2009). Once enclosures are well-established, the growing shrubs provide high-quality bee forage, with honey becoming a major source of income in some areas, such as in Atsbi Wenberta district.

In 1998, the Eastern Tigray Development Programme began work on landscape rehabilitation in Atsbi Wenberta. At the time, many valley bottom wetlands had virtually disappeared, shrubland and forest cover had dwindled, and there was a limited amount of irrigated land, making the area vulnerable to droughts and causing food insecurity (Alemayehu et al. 2009). One of the central elements of the integrated watershed management approach has been the establishment of grazing enclosures on steep degraded hills and in valleys.

One pivot of the success of enclosures was the renewed effort of communities for managing enclosures. The precedents of the traditional system of *serit* – local by-laws and the customary practice of restricting grazing during the rainy season (Gebreyohannes and Hailemariam 2011) – served as precursors for the modern practice of grazing enclosure in Tigray. For example, in Laelay Ayadim in Atsbi Wenberta, one enclosure is completely closed for grazing (cut-and-carry is allowed) for six months of the year, with the exception of cows that have recently given birth and oxen weakened from pulling the plows. Grazing of oxen is allowed during the six months the enclosure is opened (Yami et al. 2011). Another enclosure in the same area is completely closed from grazing at all times (Yami et al. 2011), and guards are hired and paid by the community to prevent the intrusion of animals during the closed period.

Scaling: Farmers and the Tigray regional government have received strong support during the project (Nedessa et al. 2005). However, top-down promotion of enclosures has proved less effective when a community is not sufficiently involved in determining enclosure sites and governing them (Yami et al. 2013). Relief Society of Tigray, among other NGOs, has had strong success expanding enclosures throughout the region. Best practices have been identified for different agro-ecologies of Tigray (Habtemariam et al. 2015).

Category of best practice

Farmer, governance

Impact

By 2005, the situation in Atsbi Wenberta had changed. Wetlands were reestablished, shrub and forest cover increased approximately ten times, and crop yields increased by 60 to 100 per cent (Alemayehu et al. 2009). Currently, nearly 100 per cent of valley bottoms are in enclosure. In addition, apiculture has thrived with the expansion of shrub cover in enclosures, and honey production is now an important source of income in Atsbi.

Lessons learned

Generally, land management options with precedent in local traditions are more likely to succeed, and participatory approaches linked to top-down promotion can be highly successful means of upscaling. Options providing multiple benefits are likely to be more feasible and provide greater benefits.

7. PLANTING CUTTINGS OF THE ELEPHANT-FOOD TREE RESTORES PRODUCTIVITY AND BIODIVERSITY IN SOUTH AFRICAN SUBTROPICAL THICKET

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The Challenge

Over the course of the years, intensive goat farming has degraded more than 1,5 million hectares of subtropical thicket in the Eastern Cape province of South Africa. The degradation has transformed the dense thicket vegetation into a desert-like open landscape, and the temperature of the exposed soil surface now reaches 70 degrees Celsius in summer. Topsoils are lost through wind and water erosion, and carbon stocks in soils and plants are depleted. Infiltration of rainwater into soils is reduced, dams are silted up and buildings are flooded. Honey production declines, and livestock and game carrying capacity is reduced up to 90 per cent. Tourists see fewer animals and the aesthetics of the landscape are compromised. While livestock farmers were affluent when the thicket was intact, now many are struggling. Indeed, the entire local economy is deeply depressed, in large part as a result of the desertification. The challenges facing the region are restoring the productivity of the environment and revitalizing the economy in the area.

Initiative/best practice

In the early 1970s, a livestock farmer near Uitenhage took a small step towards addressing the challenge. Mr. Graham Slater had built a barn at the bottom of a degraded

slope, but to his dismay, the barn was flooded whenever it rained heavily. He decided to try restoring the slope back to a dense thicket to increase infiltration of rainwater into the soil and prevent the flooding. Mr. Slater reasoned that planting cuttings of the indigenous succulent tree – the elephant-food tree (*Portulacaria afra*) – would regenerate the thicket structure, cool down the soil and allow other plant species to recolonise the site. The cuttings propagated and thrived, so other farmers and the local municipality decided to attempt similar experiments. As the elephant-food tree cuttings grew, the soil quality showed positive changes, carbon stocks in the landscape increased, infiltration of the soil improved, various plant species thrived, thicket bird species returned, and the animal-carrying capacity of the land grew considerably. Before the slope restoration, Mr. Slater was stocking the area with one goat per ten hectares – after his elephant-food tree cuttings had established a decade later, he was able to stock the slope with one goat per hectare, increasing the income from the slope tenfold.

Based on evidence from Mr. Slater's farm, the South African government decided to invest in large-scale restoration of degraded thicket. The Subtropical Thicket Restoration Programme was established and approximately USD eight million was spent between 2004 and 2016. Farmers, reserve managers, government officials and scientists joined forces to work on upscaling thicket restoration. To date, more than 10 000 hectares have been planted with elephant-food tree cuttings within nature reserves, on private land, and across the Addo Elephant National Park (photographs to be inserted). A large experiment has also been established on more than 300 quarter-hectare plots spread out over more than 1000 kilometres .

Key outcome/insight/interesting fact

The thickets in South Africa grow in a hot, dry climate and it takes a decade or more for a dense thicket structure to develop. The results of the large-scale restoration work are only just now emerging in full. One major hurdle facing the programme is that the survival and growth of the elephant-food tree cuttings varies dramatically from one landscape to another, and the factors behind this variability are not fully understood. Although large plants can withstand some frost and intense heat, cuttings are much more vulnerable. It may be necessary to plant large cuttings in certain landscapes, but this will increase the cost of restoration considerably. Another major hurdle is raising private sector finance to upscale the restoration on hundreds of thousands of hectares on private land.

Impact

Most owners of the degraded thickets have indicated that they are not in a position to finance the restoration of their land because of the considerable investment required upfront, and the long delay before the benefits result from the investment. They acknowledge that the benefits will be considerable: income streams from goat meat, mohair, venison, hunting, tourism, and honey production will increase many times over. In addition, carbon credits can potentially be generated, and there will be more water in the rivers in the dry season and during droughts. Restoration is an easy sell to the landowners – what stops them is that it can take up to two decades for the benefits to fully materialize. As a result, long-term investors – such as the ones involved in plantation or timber tree projects – will need to be brought into the thicket restoration initiatives. The investors will also need to be comfortable with the fact that the returns on their investment will not be as simple as producing and selling planks of timber. The wide range of incomes that will emerge from restored thicket will need to be bundled together. Some benefits, such as the public service of water filling the rivers even in the dry season will probably need to be financed by the government. Restoration of thickets is in short not a plain and simple investment prospect – it is complex, but has a lot of potential. The financial experts and investors should be engaged to develop financing structures that overcome the complexity.

The financial world is not averse to complexity – such financial structures as futures markets and derivative schemes also operate on risks, yet can still be utilized to provide financing for action on the ground, whether it is planting a crop or building a house. There will indeed be risk when planting elephant-food tree cuttings to restore thickets – some cuttings may not survive or take longer than expected to grow. The financial experts will in all likelihood need to mitigate against this risk by blending public finances into the investment, and scientists will need to conduct additional applied research to increase the survival and growth rates of the cuttings. Innovative ways of harvesting rainwater and channelling it to the plantings is an example of one research direction that is being explored at present.

If the appropriate financing structures are developed and funds are raised to develop the scale of operation of restoration into the hundreds of thousands of hectares, there is likely to be considerable a substantial contribution to the achievement of sustainable development goals in poverty reduction, food and water security, economic advancement, health benefits, climate mitigation and the protection of ecosystems. The productivity of the

landscape and availability of water are expected to increase dramatically, with ripple effect spreading through the entire economy. A virtuous cycle would be developed – the restored landscapes would create a platform for reviving the economy from numerous directions and income streams from goat farming, wildlife, honey production, restoration work and agriculture would all expand.

Lessons learned

The two main hurdles facing the upscaling of thicket restoration are the survival of cuttings and the financing. It is therefore critical that horticulturalists and financial experts are engaged to help the programme overcome these hurdles, and cross a threshold where the private sector will invest in the planting of elephant-food tree cuttings. In all likelihood, the initial stage will require public funds, from national budgets and international funds from sources such as the Green Climate Fund, to cover potential initial losses of investment and provide guarantees on minimum returns on the investment. Once the thicket restoration industry has matured, the private sector investors will probably no longer rely on the public funds, because the bundling of all private sector income streams is likely to be a commercially viable venture. This commercial viability cannot be readily confirmed, since no comparable project has been undertaken on such a scale in the past.

As the large-scale thicket restoration programme enters its second decade of operation, it not only considers the hurdles in its path, but also looks back to pay homage to Mr. Graham Slater. Without the successfully restored slope above Mr Slater's barn, the entire thicket restoration industry in South Africa's would probably have never materialized. To overcome the obstacles, the programme is planning round tables with horticulturalists and financial experts to help develop the course of action to ensure future success on a major scale.

GLOBAL LAND OUTLOOK WORKING PAPER



United Nations
Convention to Combat
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