



REGREENING THE SAHEL

A quiet agroecological revolution

Across large areas of the Sahel region of West Africa, one of the poorest and most environmentally precarious areas of Africa, a decades-long revolution in agroecology has produced remarkable results in improving food security and reversing environmental degradation. It has been lauded for having been led and spread by numerous local farmers, although the story of success has not been as simple as that. This case study examines the interacting factors that have led to success. It highlights the fundamental connections between human, environmental and climatic impoverishment and warns that the progress made is fragile and in danger of being reversed by conflict, competition for land and the climate crisis. At the same time, in the light of the global alarm about human vulnerability to, and interlinkages between, the climate, environmental and health crises, there may never be a better opportunity to learn from what has been achieved, take its lessons forward and take this agroecological revolution to another level of scale.

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Cover photo: Farmers weeding millet in the Ouro village, near Ouahigouya. Note stone 'diguettes', a technique to combat soil erosion © IFAD

EXECUTIVE SUMMARY

*'Over the past three decades hundreds of thousands of farmers in Burkina Faso and Niger, on the fringes of the Sahara Desert, have transformed large swathes of the region's arid landscape into productive agricultural land, improving food security for about three million people. Once-denuded landscapes are now home to abundant trees, crops, and livestock.'*¹²

Sahelian farmers, driven to desperation by the great droughts of the early 1970s and the 1980s, have ingeniously modified traditional agroforestry, water and soil management practices to restore the fertility of their land. In Niger, farmers have developed innovative ways to regenerate and multiply valuable trees whose roots already lay under their land. This 'farmer-managed natural regeneration' (FMNR) was first pioneered by outside actors but was spread rapidly by farmers once they observed its success. Changes to forestry laws and reforms of government structures that enable greater decentralization and local control of natural resources have also been significant enablers of change.

In Burkina Faso, local farmers – of whom the 78-year-old Yacouba Sawadogo, winner of a Right Livelihood Award in 2018 (considered 'the Alternative Nobel Prizes), is perhaps the most famous³ – experimented with *zaï*, which are planting pits containing manure to retain moisture and nutrients, and with stone bunds known as *diguettes* to hold back rainwater and allow it to soak into the soil. Farmers like Sawadogo deliberately set about leading the spread of successful techniques to their neighbours and then further afield, by creating farmer-to-farmer spaces, schools and networks, supported in their efforts by a wide range of international non-governmental organizations (NGOs).

The results have been improved food security for some three million people; increases in household gross incomes, by an average of 18–24%; the reversal of environmental degradation and desertification across some 6m hectares of land (an area three times the size of Wales); and around 200m new trees being grown, with a production value of over \$260m. Improvements in nutrition may, in turn, help build resilience to future health pandemics.

Climatically, the changes have meant decreased soil erosion, reduced wind speed, decreases in local temperatures and increases in rainfall, along with greater biodiversity. There is also some evidence that such techniques can reduce conflict locally, both through the process itself – i.e. the negotiations between potentially competing groups that successful agroecology entails – and as a result of increasing the size of the 'resource cake' available to all.

Agroecology (see Box 1) in the Sahel has thus become well-known for both its multiple benefits and the ways it has spread, which have been characterized as farmer-to-farmer, people-to-people, bottom-up development, working with nature – which is contrasted with misguided,

damaging, top-down, 'experts know best' engineering approaches to the environment and human development. Agroecological thinking is a continually evolving, living and flexible system, in contrast with stereotypical 'project' thinking, which is short-term, time-constrained and inflexible. This is not, however, to discount the potential positive role of other new technological advances in helping feed the world's population.

Box 1: Agroecology

Agroecology is both a science and a set of principles. It was created by the convergence of two scientific disciplines: agronomy and ecology. The core principles include recycling nutrients and energy on the farm, rather than introducing external inputs; integrating crops and livestock; diversifying species and genetic resources; and focusing on interactions and productivity across the agricultural system, rather than focusing on individual species. Agroecology is highly knowledge-intensive, based on techniques that are not delivered top-down but developed on the basis of farmers' knowledge and experimentation.⁴

A meta-analysis of 143 studies of soil and water conservation measures (SWCM) in Burkina Faso concludes:

*'It can therefore be concluded that the introduction of SWCM in Burkina Faso has improved agricultural productivity and food security, economic security, groundwater tables, tree regeneration, and biodiversity. It has also been efficient in reducing migration and poverty in the Sahel, especially in areas with a larger proportion of farmers and herders. These measures should be extended to other countries of sub-Saharan Africa with a similar physiographic and socioeconomic situation, such as Niger and Mali, since they have proven to be workable initiatives to improve food security and crop yield while conserving the natural vegetation and establishing a more resilient climate change adaptation and mitigation means of agriculture. Additionally, the involvement of the local farmers makes them rely on their own resources and see the government and other agencies as secondary support. It is therefore essential for project organizers to recognize the importance of building on experience and improving on local soil and water conservation (SWC) measures by promoting simple and low-cost technologies. The strengthening and re-organization of institutions is also necessary to help promote and oversee the successful implementation of SWCM.'*⁵

Key Insights

What farmers have achieved in 30 years across the Sahel, one of the most fragile zones on the planet, has been described as *'the greatest agroecological success story in Africa, and perhaps anywhere'*.⁶ It demonstrates how environmental health is the basis of sustainable development, food security and poverty reduction; without fertile soil, no life is possible.

This case study shows how innovation and shared learning processes developed by farmers, facilitated by INGOs and also by government

policy and action, can address key structural causes of poverty, catalyse horizontal scaling and contribute to poverty reduction.

But environmental health cannot be renewed and sustained just because it is a good thing. This case study shows that people's willingness to invest energy and resources is increased or decreased depending on how far economic and political systems help or hinder those efforts. A key insight is that environmental and political trends are interdependent and act upon each other, influencing each other's form and trajectory; as one study observes: *'Woodland decline only reinforced centralization of power and local economic decline, and regreening sped power decentralization and local economic revival.'*⁷

The poorest people – who are extremely vulnerable – have the most to gain from regreening, but it is still unlikely to be enough to make them food-secure in severe droughts through their own production or the ability to earn cash to buy food. Therefore, enhanced environmental sustainability needs to be matched by enhanced social protection and by markets that work for all and exploration of other inclusive solutions

Building some of the structures used in soil and water conservation techniques, notably *zai* and stone diguettes, requires considerable labour, which can increase workloads for women. They also require money for transport, and so relatively better-off farmers are better placed to implement these techniques (in turn employing local labour). However, women may benefit greatly in the longer term due to increased food production and better access to fuel, fodder and water.

Sustainable land management specialist Chris Reij, a Senior Fellow at the World Resources Institute (WRI), argues that now (2020) the time is ripe for an enormous expansion: heightened concerns about the intersecting climate and food crises at global, regional and national levels mean that there are political incentives for national governments and international donors to focus on agroecology, understand its multiple poverty, environmental and climatic benefits (both for climate change mitigation and for adaptation) and therefore scale it up massively.⁸

As regreening has progressed, and as climate and environmental concerns have increased everywhere, farmers and civil society organizations (CSOs) in other Sahelian countries have joined in (in Senegal, Mali, Ghana and elsewhere). Governments in the region and donor governments have – to some extent – been inspired to change policies to assist agroecological approaches.

Notably, the Government of Niger has made an ambitious pledge to restore 3.2m hectares of degraded land by 2030⁹ (266,000 hectares per year), and so it needs strategies to make that happen: the learning from this case study indicates that large-scale agroecology, especially FMNR, is the best way to do it. Other governments in the Sahel have made similar ambitious policy commitments as part of a multi-government project to restore forests across 100m hectares by 2030 called the African Forest Landscape Restoration Initiative, or AFR100.¹⁰ This was launched in 2015 by the New Partnership for Africa's Development

(NEPAD), the World Bank, the WRI and Germany's Federal Ministry for Economic Cooperation and Development (BMZ). The even more ambitious Bonn Challenge target is to restore 350m hectares of forest worldwide by 2030. Importantly, FMNR and other agroecological approaches are also influencing the 'Great Green Wall of Africa' initiative by Sahelian governments.¹¹ This grandiose vision, which all governments in the Sahel have bought into, is increasingly being modified from its original concept as a vast (new) tree-planting scheme commanded from above to something more varied and appropriate and therefore more likely to succeed. Building upon existing successes in natural regeneration, it could resemble a green mosaic more than a green wall.¹² Yacouba Sawadogo's Right Livelihood Award in 2018 gave further impetus to this. Internationally, FMNR has spread beyond the Sahel to over two dozen countries, from Haiti to Indonesia.¹³

However, there are many challenges that could stymie greening initiatives and even reverse progress so far, including impacts from the climate crisis, population growth, changing social structures, land grabs and competition for land, and increasing conflicts, which are spilling dangerously across borders.

Much more needs to be done by all parties to achieve the AFR100 vision and make agroecological approaches and regeneration of vegetation the core of the landscape restoration process and not just an add-on. Drawing on experience to date, Reij has suggested a six-step 'scalable techniques and scaling strategy' for national governments and international donors.¹⁴ These six steps are:

1. To identify and analyse existing greening successes;
2. Build a grassroots movement for greening and mobilize partner organizations;
3. Address policy and legal issues and improve enabling conditions for greening;
4. Develop and implement a communication strategy;
5. Develop or strengthen agroforestry value chains;
6. Expand research activities.

WHAT CHANGED?

THE CHALLENGE

Chris Reij, now at the WRI, has been the greatest champion and communicator of the story of greening in the Sahel and was there at the very beginning, having been hired by Oxfam to work in Burkina Faso in 1978. He describes how:¹⁵

'... the Sahel, the belt of land that stretches across Africa on the southern edge of the Sahara – has always been a tough place to farm. Rainfall is low and droughts are frequent. The crust of hard soil is, at times, almost impermeable, and harsh winds threaten to sweep away everything in their path. The Sahel, one of the poorest regions in the world, has long been plagued by droughts. The 1968–73 drought caused the deaths of not only many people but also large numbers of animals and trees – a human, economic, and environmental crisis with effects that lasted for years.

Groundwater levels plummeted, yields for staple crops – sorghum and millet – declined, and families began leaving the region en masse. Most farm households were unable to satisfy half of their annual food needs through their own production nor could they meet the deficit through food purchases. Meanwhile, the surface of barren land on the Central Plateau expanded inexorably, and empty, encrusted fields extended across significant parts of the region. Useful tree species were lost, and little natural regeneration occurred. As the landscape was denuded and exposed to severe water erosion, the land and the people became increasingly vulnerable to drought.

The devastating agro-environmental trends in the Sahel were also weakening the social fabric. Entire families left the region to settle elsewhere, or husbands migrated to coastal countries to earn income, leaving their families behind during increasingly long periods. By 1980, for many farmers, the choice was simple: claim back their land from the encroaching desert or lay down their tools and leave.'

POVERTY REDUCTION

In southern Niger, Reij estimates that FMNR has now improved nearly 6m hectares of land, which produces more than 600,000 additional tons of food a year (the same amount as Niger's national food deficit in the drought of 2011–12). This additional production could feed more than 2.5 million people. Furthermore, as well as staple cereal crops of sorghum and millet grown among the trees, tree crops such as baobab or gao, which provide fodder, firewood, fruit or medicine, have enormous value.¹⁶

The World Bank estimates that the annual production value of the new trees in Niger is at least \$260m, which flows directly back to farming

families, either as cash or as produce. In the region of Maradi it was estimated that, in 2008, 62,000 farm families practising a full version of FMNR had generated an additional gross income of \$17–23m per year, contributing up to one million new trees to the local environment. Financial benefits through sales of tree products and increased grain and livestock production were estimated to be up to \$250 per hectare, and adoption of FMNR appeared to increase household gross income by between 22,805 and 27,950 CFA francs (about \$46–\$56) per capita, or between 18% and 24%.¹⁷

Reij writes how:

‘Sahelian women may have gained the most from the land rehabilitation techniques. The innovations have greatly improved the supply of fuelwood over the past 20 to 30 years, allowing women to reallocate the time once spent on collecting fuelwood to other activities, including producing and preparing food and caring for children. Women in the Zinder Region who own baobab trees also earned substantial annual income (up to \$210) from the sale of tree leaves used to make sauce for the daily porridge. Farmers report that women involved in FMNR have a stronger economic position and better capacity to feed their families a nutritious, diverse diet.’¹⁸

However, it is noted that in Burkina Faso what has not changed is that customary land tenure systems do not permit women to own land, even though they represent more than half of the agricultural workforce, which affects the implementation of soil and water conservation measures.¹⁹

A further significant benefit is that the process needed to make FMNR necessitated a reduction in local conflict.²⁰ Village farmers must come to agreements with other land users, such as cattle herders, in order to protect seedlings from ‘cattle and axe’, especially during the first three or four years of growth. The reward is a growing ‘resource cake’ for all: pastoralists gain access to more biomass (fodder) while the farmers gain access to the herds’ manure, and this reduces conflict in a virtuous spiral.

In Burkina Faso, the *zai* and stone bunds known as *diguettes* are estimated to have helped to rehabilitate up to 300,000 hectares of land and produce an additional 80,000 tons of food per year, enough to feed half a million people.²¹

STRUCTURAL CHANGES

This case study shows how poverty can be reduced by the individual and collective agency and innovation of farmers and how this can be spread through their own social networks and shared learning processes. It also shows how external agencies, including NGOs and governments, have helped to enable large-scale horizontal diffusion, both through supporting farmers’ networks and via more formal (and sometimes neglected) agricultural extension work.

The greening story often focuses – and justifiably – on how it helps to

remedy the loss of soil and water which is one of the most fundamental structural causes of poverty for many small farmers. Soil and water are their most basic resources and underpins their ability to grow food. However, as this case study tries to show, what has happened in the Sahel is also directly interwoven with other structural causes of poverty. It is profoundly connected to – and it has changed – power relations, especially between the centre and the peripheries. Regreening has also changed institutional policies directly affecting people's lives and affected cultural beliefs, social norms and behaviours.

DURABILITY

Major questions remain, however, around just how durable the gains will be in light of the many challenges. Can environmental improvement, enhanced food security and a degree of income poverty reduction be maintained given the sheer scale of food poverty and vulnerability? In Niger, official statistics indicate that nearly 20% of the rural population are in a critical food situation even in normal (i.e. non-drought) years.²²

For example, the region of Maradi in Niger has become famous as the place where FMNR started and spread, yet despite the well-documented adoption of FMNR by farmers there, it continues to be an epicentre of severe food and malnutrition crises during major droughts. A report for Oxfam and others in the Sahel Working Group²³ points out that in Maradi very poor households produce on average only 17% of their basic food needs. Even if they doubled or even tripled food production for their own consumption, they would still have to purchase at least 40% of their food from the market. *'The brutal, unpalatable reality is that a pervasive, on-going, structural food crisis exists in the Sahel ... income poverty is a major cause,'* says the report.

The majority of people, especially the very poorest, must therefore look to different survival strategies combined with or largely outside local agriculture, notably migration for agricultural work elsewhere, especially in Côte d'Ivoire, or in mining and gold panning or in the cities.

Vulnerability is further increased by conflict which can disrupt trade and livelihoods and restrict access to food. In Mali and Nigeria inter-communal tensions are reportedly increasing between sedentary farmers and traditional pastoralists over the use of grazing land. Recently Maradi in Niger has seen an influx of refugees from conflict in neighbouring Nigeria. Out-migration in turn adversely affects the ability of farmers to implement regreening methods if they involve heavy labour. Climatic impacts are also reportedly reducing the productivity of key food crops and livestock, undermining the livelihood of farmers in Niger and exacerbating vulnerability to food insecurity.²⁴

Therefore, for the poorest households, agroecology can only be a part of the solution. Other measures must be implemented to protect them and enhance their ability to earn money or to supplement and improve their agricultural prospects, and these require government action.

HOW CHANGE HAPPENED

PATHWAYS TO SCALE

Change has occurred as a mix of spontaneous processes among farmers and subsequently intentional strategies to support and help spread their innovations via shared learning processes. Reij describes how *'the re-greening of the Sahel began when local farmers' practices were rediscovered and enhanced in simple, low-cost ways by innovative farmers and nongovernmental organizations'* in response to the droughts and environmental catastrophes of the 1970s and 1980s, which destroyed livelihoods and threatened survival. He adds that *'the process by which these innovations emerged – through experimentation, exploration, and exchanges by and among farmers themselves – is possibly the most vital lesson learned from the Sahel'*.²⁵

The routes to scale were largely horizontal at first. According to Reij: *'An evolving coalition of local, national, and international actors then enabled large-scale organized diffusion and continued use of these improved practices where they benefited farmers.'* Horizontal scaling occurred largely via self-spreading and by voluntary adoption due to the multiple benefits that farmers derived from the innovations.

Subsequently, a degree of vertical scaling was achieved as governments introduced enabling policies, notably – and partly as a side-benefit – from decentralization of powers to more local authorities.

The innovations were spread initially by farmers and by CSOs into Niger, Mali, Senegal and Ghana. Techniques have also been spread through methods such as learning exchanges, local radio programmes and contests to find the most successful farmer. The contribution of local government agricultural extension workers might have been under-acknowledged.

CONTEXTUAL DRIVERS

Socio-technical innovations and new practices

The key drivers of change were farmers, supported by NGOs and others, rediscovering and enhancing agricultural innovations. These innovations included earthen bunds designed to reduce soil erosion, harvest water and improve yields, and FMNR to restore trees. Although these practices were driven primarily by farmer innovation over three decades they included numerous interventions by nongovernmental organizations and

donors (so assessing the contributions of different actors and their impacts is difficult).²⁶

Colonial legislation and its legacy on farmers' practices and social norms

Colonial history explains why the region of Maradi, in particular, suffered from extreme environmental degradation. Until the 19th century large areas of the region were uninhabited and uncultivated. French colonization encouraged rapid in-migration taking advantage of relatively good rainfall in the 1950s. But the northern part of Maradi was always marginal for farming.²⁷ When rainfall patterns reversed from the 1970s, and with the trees mostly gone, soil and water resources started to disappear.

Colonial laws, which were inherited by the new nations of Burkina Faso and Niger, also partly explain why farmers were farming in the ways that they were, which were damaging the environment. These laws encouraged farmers to clear fields for crops and conditioned them to see trees as useless weeds, while at the same time trees were the property of the State and farmers could be fined for damaging them. The upshot was that trees were regarded with indifference or hostility, as nuisances and sources of trouble.

Misguided development policies

Misguided and top-down development projects added to the problems. During the 1960s and 1970s, foreign aid donors built earthen bunds designed to reduce soil erosion over thousands of hectares of Burkina Faso's Yatenga Province. But local people were not involved and found the bunds of no use, so neglected or even destroyed them.

Drought and declining food security

In the face of drought and declining food security, from around 1980 a number of Yatenga farmers began to experiment with traditional planting pits or *zai*. Their innovation was to increase the depth and diameter of the pits and to add organic matter. That resulted in remarkable increases in yields and use of the pits spread rapidly. Several farmer-innovators were central to this process. Farmers like Yacouba Sawadogo began organizing market days and seed exchanges to promote planting pits. By 2000, Sawadogo's market days involved farmers from more than 100 villages. Another pioneer farmer, Ouseni Zorome, began a '*zai* school' at the roadside. By 2001 his efforts had spawned more than 20 such schools with 1,000 members. Other farmers did similarly.²⁸

A simple technical innovation by Oxfam also helped to improve yields.²⁹ Mathieu Ouedraogo, Oxfam's project director in the 1990s, explained how then *'the people were very fatalistic. They would say, "God has done this". We would say, "Do you remember when there were trees here, and the rains were good and the wells were full?" And now the trees are gone*

*and there is no rain and wells are dry. Who cut the trees? Who lit the bush fires? It was man who did it, not God, and man must reverse it.*³⁰

Farmers had been building stone contour bunds to harvest rainwater, but these needed to accurately follow contour lines for the run-off to collect and spread evenly. Contours were difficult to mark accurately in a very flat landscape. Oxfam invented a simple spirit level – a transparent plastic hosepipe between two marked sticks, which when filled with water allowed farmers to mark out contours accurately. It cost just \$6 to make and was easy to learn to use. Building on existing indigenous knowledge and practices, as Oxfam's partner Projet Agro-Forestier (PAF) did in Burkina Faso, has been crucial. Other soil and water conservation programmes in Burkina Faso are documented to have faltered or failed because farmers never felt part of the process.³¹

In neighbouring Niger, farmers began experimenting with FMNR. The original model was developed by an Australian agronomist, Tony Rinaudo, now with World Vision, who observed that farmers' cleared fields contained extensive networks of still-living tree roots and stumps – a so-called 'underground forest'. Farmers could choose useful trees and regenerate them and grow crops among them. This restored soil fertility, reduced wind speed, sand infiltration and evaporation, and provided firewood, fodder, fruit and medicinal products.

The impacts of colonial law and its lasting hangover on people's personal agency and local social norms explain why the majority of farmers, even those traumatized by the droughts, were initially reluctant to regenerate trees and even actively hostile to the idea, and why the initial pioneers of agroecology ran into considerable opposition. Accepting his Right Livelihood Award in 2018, Sawadogo described how *'it was really rough at the beginning. No-one would understand me as I abandoned trade for bushland. Worse, some would try to discourage me. I could feel how my own family and friends were saddened and how they disapproved of my choice. They all were convinced I was being foolish. Some would even think I had lost my mind. Sections of my forest were burnt down on three occasions. I would never retaliate.'*³²

Alongside Sawadogo, Rinaudo also received a Right Livelihood Award in 2018. In an interview with a journalist,³³ he described how when droughts struck Niger in 1984 and 1985, farmers were given an ultimatum: unless they protected their trees, they would get no food from his famine relief programme. *'A lot of them hated me,' he said. 'They protected roughly half a million trees but, when the famine was over, two-thirds of them chopped down their trees again. It was the other third that made all the difference.'*

Shifts in government understanding and policy

Early environmental protection strategies were influenced by colonial practice, and forest administration was strongly coercive (and its agents often corrupt and brutal). In the 1970s the state took active measures to promote reforestation, though with disappointing results. A new policy of food self-sufficiency in the 1970s led to land grabs and poor agricultural

policies. Recognizing that things had to change, and with international donor support, the Government of Niger began a national debate on, and a national fight against, 'desertification'— a concept which had come to the forefront of international thinking as a result of the Sahelian droughts.

Agronomist Yamba Boubacar has analysed how naturally assisted regeneration in Niger took place in relation to the country's anti-desertification strategy from the 1960s onwards, and how *'the 1980s were pivotal years in which power was decentralized to local communities and institutions.'*³⁴

A landmark debate took place in Maradi in 1984 which involved all government ministries and departments and national and international organizations and donors. A consensual document was adopted, known as the Maradi Commitment, which set out a programme of actions structured into 11 sub-programmes and which subsequently became national policy. This broke with the technical approach of the 1970s by supporting an environmental policy whose main strategy was to make local people responsible for anti-desertification initiatives. The severe drought of 1984, which raised questions about accepted forestry dogma, saw a gradual shift from protection to management, with management being conducted through cooperatives and local organizations.

Similar processes occurred in Mali. From the 1960s to the 1990s, centralized, national environmental management and population pressures resulted in soil degradation on a massive scale and the national spread of food insecurity. Initiatives intended to promote more sustainable environmental management actually had the opposite effect. In the Mopti region, communities mobilized to stop the cycle of desertification and vulnerability by restoring traditional farming practices and reviving a traditional community-based organization, the Barahogon association.³⁵ The village of Ende was the hub of the revitalized Barahogon system and of agroecological success and has since become famous. The techniques have been spread through methods such as learning exchanges, local radio programmes and contests to find the most successful farmer.

Self-spreading and voluntary adoption are the best indicators that people are gaining real and valued benefits. The Malian government took important legal and legislative steps in the 1990s to decentralize powers to regional and community authorities such as the Barahogon network. However, compared with Niger, effective implementation of legislation on decentralization, and its application to environmental management, has been less effective so far. To centralize or to decentralize has been a political process of ebb and flow, stop and start, and laws on the ownership and management of trees are still confusing and even contradictory.³⁶

Economic drivers: austerity and institutional reform

Niger's policy shift was also driven partly by political and financial necessities. In light of the savage structural adjustment programmes imposed by the International Monetary Fund, the State simply did not have the resources to tackle desertification itself. While this deprived the Maradi–Zinder region of central government resources, it also meant that forestry officers – ‘a quasi-paramilitary force that on occasion could perversely interpret the law so as to extract prohibitive fines’ – no longer determined tree management on farmers' fields.³⁷

The processes of administrative reform to improve social and economic development programmes continued into the 2000s, with further decentralization of powers over the environment and natural resource management to regions, departments and communes. Boubacar writes:

‘One of the most innovative aspects of this process has been the creation of a local institutional base as a catalyst for organized action, rather than as a mechanism for distributing the benefits of State- or project-managed improvements. This marks a shift from the logic of “benefit-sharing”, long used by central governments to obtain local people’s cooperation, to “power sharing” that aims to transfer responsibility to local communities.

This approach appeals to local people who no longer want to be treated as the passive recipients of project assistance. It uses a flexible procedure with no fixed guidelines, major financial costs or fixed quantitative objectives, which local actors can adapt and shape to their particular circumstances. The effectiveness of the strategy is largely due to the emphasis on making the best use of existing resources and local creativity, rather than identifying problems and trying to use pre-existing solutions to resolve them. This marks a fundamental change in both the technical and socio-organizational aspects of the approach, which encourages villagers to ask why and how actions are being taken and how best to organize themselves.’³⁸

Because the actions of the State were sometimes neglectful or dubious, and because INGOs have taken a lot of credit for helping farmers, the contribution made by local government agricultural extension workers might have been underestimated. In Burkina Faso government workers were under-funded, or they were diverted to work in cotton and other cash crop zones, but they formed a consistent structure when INGOs were sometimes transient. In Yatenga, Oxfam's partner organization PAF worked closely with state extension agents, and surveys in 1993 showed that more people gained their knowledge of diguettes from government workers than from PAF.³⁹

International drivers

Throughout the 1970s and 1980s, and up to the present day, the Government of Niger has also been strongly influenced by international developments and conferences on poverty and the environment. In 1996, Niger set up the National Environmental Council for Sustainable Development to implement, monitor and evaluate its national

environmental policy, which would be put into effect through a Poverty Reduction Strategy Programme and a National Environmental Plan for Sustainable Development. In turn, international donor thinking has been informed by the agroecological experiences of the Sahel.

In summary, as Reij and others conclude,⁴⁰ *'no single actor, policy or practice appears behind the successful greening of the Sahel. Multiple actors, institutions and processes operated at different levels, times, and scales to initiate and sustain this reforestation trend.'* It is the dynamic interactions of these many processes that have turned vicious circles into virtuous circles. These are continued and may be strengthened further, although there is no guarantee that greening will not go into reverse. There are many pressures. Environmental and political trends are interdependent and act upon each other, influencing each other's form and trajectory, as we have seen.

Sendzimir, Reij and Magnuszewski draw the following comprehensive lessons in Ecology and Society: *"Systems analysis also shows why there was no single silver bullet to restore the integrity of agro-ecosystems or the communities that relied on them. A number of interventions at different scales and at different times combined to foster successful woodland regeneration. These ranged from the intentional, NGO-supported discovery and propagation of farmer-managed natural regeneration, to the unintentional decrease of national oversight of forestry practice in the Maradi/Zinder region. Realizing the full potential of farmer-managed natural regeneration required mutual support from multiple resources. In searching for new solutions, NGOs built on human and social capital at local levels and integrated these with evolving human and social capital at regional and international levels. Improving relations between farmers and herders has enhanced integration at local and regional levels. It was further enhanced by improving social capital and governance at national/international levels. Coming a decade after local social capital was enhanced by the emergence of tree management oversight committees at the village and commune levels, the seeds of new forms of federal governance emerged as new national policy in response to dialogue between the national government and international organizations.*

*'Above all, systems analysis offered the rare insight that the pattern of interactions between key resources was more important than any single resource itself. Regreening resulted not so much from introducing new technologies or new processes but from reversing the direction of reinforcing feedbacks in existing processes.'*⁴¹

ANNEX: AT A GLANCE

Case study name	<i>Regreening the Sahel: A quiet agroecological revolution</i>
<i>Geographical location</i>	Multi-country (primarily Niger and Burkina Faso)
<i>Geographical type</i>	Environmentally fragile, extremely poor nations with low Human Development Index (HDI) indicators; with fragile governance systems; and where certain areas are affected by conflicts of different kinds.
<i>Time period</i>	From around 1980 to the present day.
<i>Systemic challenge</i>	Soil and water conservation and regeneration of vegetation in response to environmental degradation and climate change, which are exacerbating food insecurity, resource scarcity and economic impoverishment. Regreening has had impacts on gender justice and economic inequality, albeit limited.
<i>Type(s) of poverty reduction</i>	Greater income; increased access to resources; increased food security; more sustainable livelihoods; restoration of soils and water with positive local climatic changes; reduction of local conflict; gender poverty reduction in some respects.
<i>Scale of poverty reduction</i>	Improved food security for around three million people; increases in household gross income by an average of 18–24%; reversal of environmental degradation and desertification across some 6m hectares of land (an area three times the size of Wales); growth of around 200m new trees with a production value of over \$260m.
<i>Structural Changes</i>	Environmental breakdown and drought disasters; ideologies, customs and practices; inadequate technologies; some impacts on political systems/structures; limited market linkages.
<i>Pathways to scale</i>	Mix of intentional & spontaneous with slow/quick phases. Primarily horizontal and in-depth scaling.
<i>Limitations</i>	Scaling is more possible for farmers who are relatively better-off (in terms of land ownership and income) and able to employ others, because employing certain techniques requires significant labour and income. Thus they may benefit most in absolute terms; this, however, does create employment opportunities. Poorer farmers – with less land, low food production and high levels of vulnerability – may gain the most in proportion to their low starting base in terms of own-food production and income generation, but because of extreme poverty they might still not be able to scale up food production sufficiently to ride out severe drought years without suffering food insecurity. Their food insecurity is reduced but not eliminated. Poor women may face extra demands on their labour if constructing diguettes (ridges or lines of stones built for water or soil conservation), but then are likely to benefit from these and other techniques, once established, through easier and greater access to fodder, firewood, food and water.
<i>Quality of evidence</i>	Evidence of some positive impacts is high, notably environmental impacts (more vegetation coverage, revived water tables, locally reduced temperatures and reduced wind damage). Improvements in total grain surpluses per department have been recorded. At household level, evidence is of medium quality. Evidence of greater production and improved household food security outcomes – the main measure of vulnerability – is strong. Evidence of improvements to incomes is difficult to pin down.

	<p>There are some difficulties with quantitative evaluations due to the duration, scale and nature of the spread of greening, lack of or shifting baselines, the many different actors involved and the complexity of interactions. However, there is a strong case for attributing many of the positive impacts primarily to greening initiatives.</p>
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NOTES

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