Landscape restoration is more than land restoration: Dryland development in Ethiopia and Kenya

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"Dryland restoration transforms lives and landscapes by building ecosystem and livelihood resilience "

Introduction

Drylands constitute 40% of the Earth's land surface, supporting the livelihoods of almost one-third of the global population (Reynolds et al. 2007). They are under severe pressure from human activities and climate change, with 25–35% now considered as degraded; this is expected to worsen (IUCN 2017). As in other regions, drylands in the Sahel and Horn of Africa suffer from reduced agricultural productivity, food and nutrition insecurity, limited economic development, inadequate water management, declining resilience to climate variability, social and political instability, and human migration (Yirdaw et al. 2014; Delgado et al. 2015).

The past decade has seen increased attention to and promotion of landscape restoration to address chronic problems of deforestation and degradation, alleviate poverty, and build resilience to climate change (Yirdaw et al. 2014). To be effective, this requires the engagement and participation of all stakeholders, including local communities.

This article presents achievements, impacts, lessons and insights from the Netherlands-funded Drylands Development Programme (DryDev) in facilitating land restoration in the Sahel and Horn of Africa, with a focus on Ethiopia and Kenya. DryDev, which ended in 2019, was a multi-sectoral, multi-partner and multi-country initiative implemented in Burkina Faso, Ethiopia, Kenya, Mali and Niger, targeting semi-arid areas with mean annual rainfall of 400–800 mm. The six-year initiative supported smallholder farmers to pursue contextually appropriate options to make the transition from emergency aid and subsistence farming to sustainable livelihoods.

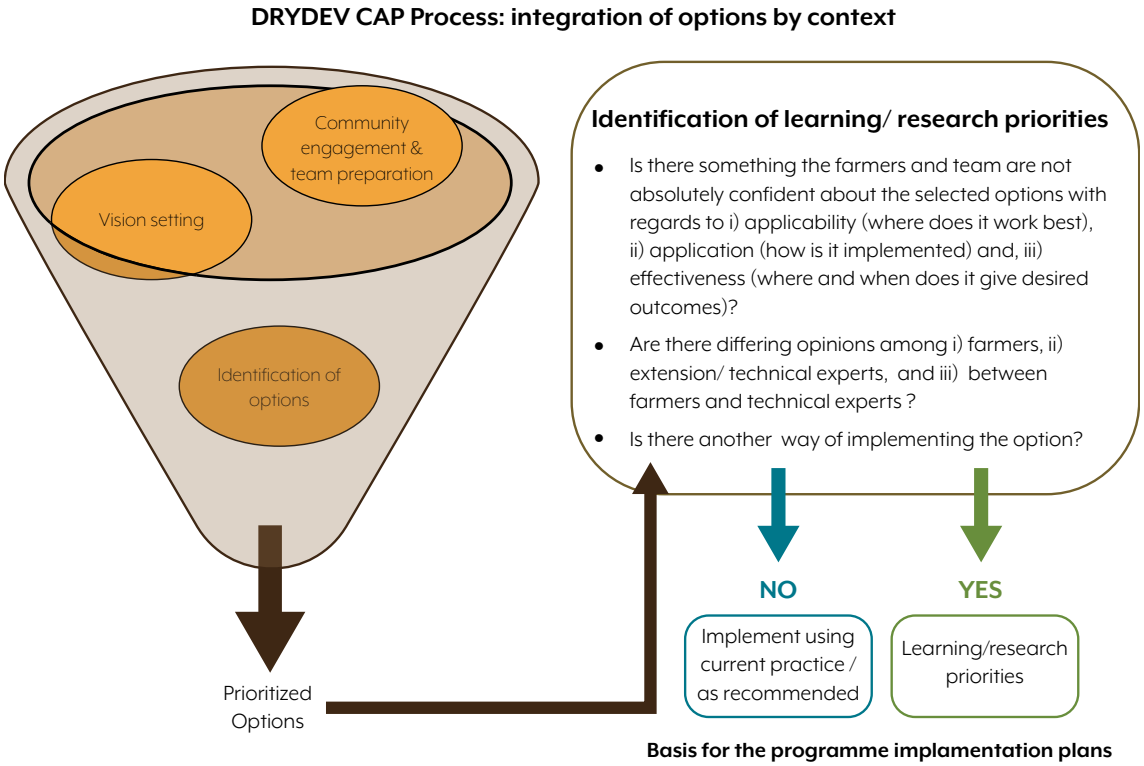
Approaches and stakeholder engagement

DryDev adopted a sub-catchment/watershed management approach to identify sites and activities, which was crucial, since management of water and hydrological systems is critical for restoring degraded drylands. However, conceptualising, defining and developing catchments was especially challenging in the Sahelian plains due to expansive geographical coverage. This led to delays in implementation. It was also observed that the success of large development initiatives is contingent on identifying and implementing appropriate innovations that are scalable at the local level.

DryDev used the "options by context" approach to promote interventions that were prioritised by smallholder farmers and informed by local realities, and that integrated local and expert knowledge (Figure 1; Coe et al. 2014; Sola et al. 2017). This presupposes community involvement from the outset that upholds key principles of inclusiveness and bottom-up processes. The programme facilitated robust community-level visioning and action planning, involving various categories of farmers to identify options, interventions, learning and research priorities in 29 sites/sub-watersheds in Ethiopia and 28 in Kenya. A co-learning framework was used to select, refine and review the appropriateness and performance of various options. In addition, multi-stakeholder events facilitated sharing and learning at the community, sub-national and national levels (Sola et al. 2017).

The landscape-level sub-catchment management approach requires coordinated and integrated processes to simultaneously address rural economic development, poverty reduction and environmental sustainability goals (Delgado et al. 2015). The programme was guided by three

Figure 1: Community action planning and option prioritisation processes. Source: Sola et al. (2017).



core values — integration, farmer-led processes, and leveraging strategic partnerships — which together facilitated a massive mobilisation of people to participate in restoration activities.

In addition, the involvement of sub-national level institutions with adequate capacity was critical for the sustainability of interventions. The programme improved local governance by enhancing the capacity of local duty-bearers. In Ethiopia, this was targeted and driven by district steering committees that were designed to provide support to joint planning, training, and community mobilisation. In Kenya, the focus was on establishing, supporting and strengthening farmer organisations, alongside concerted efforts to engage and inform policy makers on issues that constrain land restoration and livelihood development.

Almost 80,000 smallholders were engaged in applying various interventions: 43,922 in Ethiopia and 35,363 in Kenya. Throughout the six years, the target of 50% women engagement in activities was not reached in Ethiopia. Most of the land restoration work was undertaken by men who had more decision making power on land matters and could undertake tasks that needed physical strength. In Kenya, a higher proportion of women — more than 60% — were engaged; most men were often absent, working in the cities. Notwithstanding this, women's empowerment in both countries was one of the major impacts of the programme due to their increased engagement in agriculture production and economic activities.

Land restoration outcomes and benefits

Increased agriculture productivity

More than half the targeted farmers were involved in land rehabilitation using terracing, contour ridging, gully reclamation, check and sand dams, tree planting, reseeding grasses and farmer managed natural regeneration (FMNR). These led to improved natural resource management on 50,711 ha in Ethiopia and 13,472 ha in Kenya. This had a huge impact on communities, with degraded areas transformed into productive land, and an increased water supply. Some rehabilitated sub-watersheds, such as Dimello in Tigray, Ethiopia, became learning sites for government agencies and other stakeholders as a model for successful rural development. Implementation of sub-catchment management

Infiltration pits for soil and water conservation in Dimello sub-watershed, Ethiopia (top), and maize and potato irrigated using harvested water from rejuvenated springs in Saise Tsaeda Emba, Ethiopia (bottom). Photos: World Agroforestry

plans also catalysed local restoration efforts and sustainable grazing management. Relatively more land was rehabilitated in Ethiopia compared to Kenya, because private and absentee land holdings common in the latter resulted in protracted negotiations that limited rehabilitation and delayed implementation.

Improved grazing management

In Ethiopia, smallholders transformed overgrazed pastures into grasslands by adopting a system of zero grazing plus a cut and carry system for animals at home, which enabled farmers to begin cattle fattening and dairy production. In Kenya, farmers reseeded degraded lands, including some crop fields, allowing one women's group in Makueni to begin goat breeding. The group of 111 members earned additional and much needed income from annual sales of US$4,800.

On-farm soil and water conservation

A key goal for DryDev was to support environmentally sustainable food production and water security through climate-smart production practices by investing in on-farm and off-farm soil and water conservation. Rainwater harvesting and constructing storage structures on a cost-sharing basis enabled 12,966 farmers in Ethiopia to begin using irrigation on 4,718 ha, and 2,317 farmers in Kenya on 554 ha. Farmers who constructed *zaï* pits, contour bunds, terraces or infiltration trenches on their fields saw a three-fold increase in yields, to 3–4 tonnes per hectare of maize.

Small-scale irrigation and soil and water conservation techniques improved yields, leading to surpluses, and access to markets through organised groups enabling households to increase income. This in turn reduced youth out-migration to various Gulf states from Tigray and Oromiya in Ethiopia, and to urban areas in Kenya. Participants saw benefits in small-scale

Pasture rehabilitation through reseeding grasses and a zero grazing plus a cut and carry system in Makueni, Kenya, before intervention (top) and 12 months after intervention (bottom). Photos: Caritas Kenya

Climate-smart production options included micro-irrigation from ponds and sand abstraction in combination with drip systems; tomato under drip irrigation in Jarso, Ethiopia (top), and green gram and maize on ridges and *zaï* pits in Kitui, Kenya (bottom). Photos: World Agroforestry

commercial agriculture supported by technologies such as farm ponds, water tanks, solar pumps and drip irrigation kits, producing products for insatiable local markets. Two main outcomes were that in Kenya, the number of farmers consuming five or more food groups per day increased by 15% compared to those in non-project sites, and in both countries, women's control over income increased significantly following their involvement in the programme as measured by the Women Dietary diversity indicator. This was catalysed by capacity building and peer-to-peer training within groups. Efforts were made to prioritise and develop value chains for women, with training in financial management and entrepreneurship, and to encourage them to join savings and credit schemes to improve their financial independence.

Lessons and insights

Local governance and institutional mechanisms

Enabling sub-national governance systems can make the ultimate difference. These systems, and the existence of stakeholders with the capacity to engage and leverage resources, played key roles in success. Buoyed by enabling policies on watershed management, DryDev Ethiopia registered impressive results: all 29 target watersheds implemented both biological and physical structures as the first step in the programme's sequential approach. This started with watershed management, then on-farm soil and water conservation, climate-smart production, and finally market and financial linkages. These achievements were extensively supported by empowering sub-watershed management committees. Their responsibilities included mobilising communities, developing local bylaws to control land degradation in communal areas, and overseeing the development and maintenance of infrastructure.

In contrast, Kenya did not have an adequate guiding framework for watershed management. The national Water Act requires that sub-catchment management plans be developed and implemented by water resource users' associations. However, these associations were constrained by a lack of understanding of legislative provisions regarding their mandate and legitimacy. But by the end of the programme this was clearer due to formal registration and training. These efforts in turn facilitated the rehabilitation of riparian land, complementing work by farmer organisations in open areas that showed the opportunities for significant scaling up.

Land tenure and land policy can pose challenges to restoration efforts. Most DryDev sites in eastern Kenya were under private land ownership, with many absentee land-owners, which constrained farmers' ability to manage landscapes for the common good. The initial focus on on-farm activities became a key entry point, with water harvesting using farm ponds; later, off-farm water buffering using sand dams incentivised farmers. Ultimately, communities, government agencies and private-sector actors and water users'

Land rehabilitation for increased productivity using soil and water conservation measures, FMNR and enrichment planting in Machakos, Kenya, during intervention (top) and two years after intervention (bottom). Photos: WVA

associations were supported to implement an integrated approach of terracing, water conservation, enrichment tree planting and FMNR, and some areas became learning sites that attracted both national and international visitors.

Strategic partnerships increase impact and scaling

Leveraging resources through partnerships was a key strategy that increased access to extension and technical support. In Ethiopia, regional and local governments leveraged financial, technical and social support schemes such as the Productive Safety Net Programme to support large rainwater harvesting structures such as check dams. However, it was difficult to adapt and scale up successes to other countries that didn't have similar or adaptable governance systems. In Kenya, devolution began only as the programme was being launched, and new sub-national governments could not offer much support until the final three years. Country consortia were nonetheless quick to adopt a model that integrated farmer-to-farmer extension, which catalysed engagement and included the training of 35,363 smallholders (65% of whom were women).

Generating evidence for learning and scaling

Tree planting is commonly the main intervention in landscape restoration, but in drylands there are significant challenges relating to poor seedling survival and growth. These challenges have been attributed to erratic rainfall, planting of ecologically unsuitable tree species, poor quality seedlings, and poor tree seedling management practices (Magaju et al. 2019). Innovative methods were co-designed and implemented with farmers as part of the co-learning and action research component of the programme (Coe et al. 2017). Tree planting "planned comparisons" were undertaken with co-funding from a parallel EC-funded project engaging 1,906 farmers in Kenya and 260 in Ethiopia. Farmers tested different mulching materials, watering regimes, manure application

Land rehabilitation and water buffering with check dams in Tigray, Ethiopia, with support from district governments and Relief Society of Tigray (REST). Photo: REST

and planting hole sizes. Best practices led to survival rates after 15 months in Ethiopia of 57–90%, compared to the usual 30%, with 8–20% increases in survival in Kenya over a similar period (Figure 2a and 2b).

In Kenya, species included *Melia volkensii*, *Azadirachta indica, Senna siamea, Mangifera indica, Carica papaya, Moringa oleifera* and *Calliandra calothyrsus*. In Ethiopia they mostly included *Faidherbia albida, Moringa stenopetala, Olea europea, Persea americana, Mangifera indica, Psidium guajava* and *Grevillea robusta*. In addition, tree planting was undertaken together with FMNR, an option dubbed FMNR plus that was implemented on 8,000 ha in Ethiopia and 1,670 ha in Kenya. By the end of the programme, 3,320,895 trees had been planted on farmland or communal areas in Ethiopia, and 164,658 in Kenya. In one district (Samre, Ethiopia) more than 2,000 naturally regenerating seedlings, saplings and trees of 11 woody and shrub species were recorded in a 0.1 ha FMNR plus plot.

Conclusions

There were four main lessons. First, access to inputs — including tree genetic resources, technologies and finances — is a crucial incentive and enabler for implementing dryland restoration. Second, success is contingent on appropriate policy and institutional mechanisms that facilitate community participation, and on resource leverage to increase technology adoption and restoration at scale. Third, tailoring of interventions to the local context, evidence generation and collaborative learning with farmers and other stakeholders are critical for increased adoption and scaling. Fourth, smallholder access to extension services can be increased by participants joining farmer organisations, with an observed increase of 18% in households accessing extension in project areas in Ethiopia, and a 2% increase in Kenya where farmers were already working in groups.

In summary, designing a successful drylands development intervention with landscape restoration as a major focus is contingent on selecting the right mix of environmental, agronomic, economic and institutional options to address and target the drivers of degradation (Yirdaw et al. 2014). These options must be tailored to local contexts, must be affordable, and must generate tangible benefits to encourage participation. They must also be supported by a community-based advisory system such as farmer-to-farmer extension to facilitate access to information.

Financing dryland restoration for impact at scale is critical. It requires large, integrated and long-term investments that are beyond the scope and duration of most projects. This calls for public-private partnerships that can catalyse technological innovations, leverage resources, help people learn and engage and scale up and out beyond a project's target landscape and country. After all, the benefits of restoration far outweigh the costs of degradation and the losses that accrue from inaction (Yardaw et al. 2014; Mulinge et al. 2016).

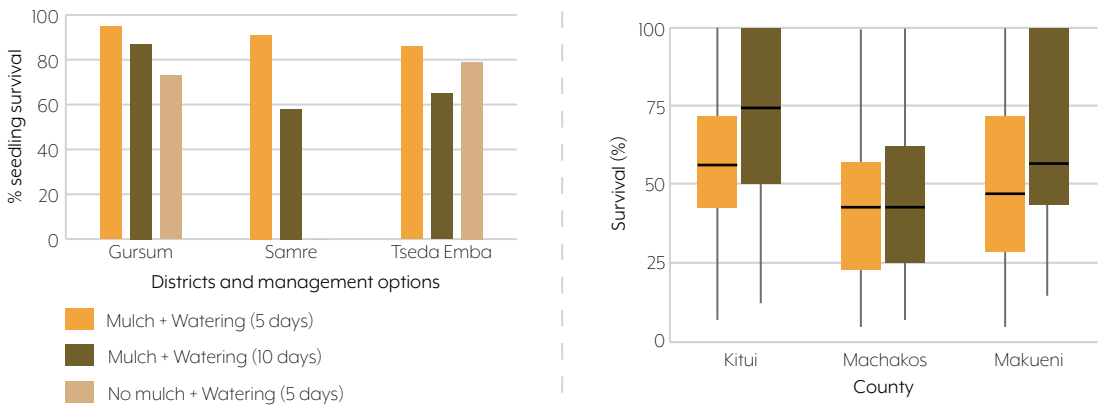


Figure 2a and 2b: Seedling survival rates from planned comparisons in Ethiopia (left) and Kenya (right). Source: Magaju et al. (2019)

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