

Building climate-resilient landscapes in Ethiopia's lowlands

Climate change profoundly impacts global agriculture and food security, especially in the Horn of Africa's arid and semi-arid regions. Our authors present the broad challenges faced by agro-pastoralists in this context and highlight the potential of an integrated approach for the rehabilitation and productive use of lowland regions.

By Ahmed Abdalla and Miriam Kalkum

The lowlands of Ethiopia are primarily inhabited by (agro-) pastoral communities. Climate change causes longer drought spells and increased incidences of intense floods. This, in combination with greater population pressure and intensified demand for livestock on grazing land, has contributed to the overexploitation of natural resources. With the current widespread degradation of the land, evident in poor vegetation cover and low soil infiltration capacity, the once replenishing floods from the highlands have become a force of destruction, most apparently seen in the formation of deep gullies along the escarpment floor. The floods no longer nourish the land but instead devastate it, along with the livelihoods of millions of inhabitants. This process has started in many dry valleys that were once covered with dense grass. Over time, these areas lost their drought resistance, and during rainy seasons, the water often causes more erosion than regeneration.



Pastoralists in the arid regions of Ethiopia's lowlands are struggling with the harsh effects of drought and limited resources to sustain their livestock.

Photo: Klaus Wohlmann/GIZ

The Dry Valley Rehabilitation and Productive Use (DVRPU) approach

In this situation, the Dry Valley Rehabilitation and Productive Use (DVRPU) approach can act as a gamechanger. It is a comprehensive strategy aimed at enhancing drought resilience in lowland regions, specifically benefiting pastoral and agro-pastoral communities. The approach incorporates measures addressing social, technical, biological, economic, institutional and governance aspects. It integrates flood-based farming in arid and semi-arid lowlands. Flood-based farming involves repurposing flood-prone land, utilising residual floodwater for crops and integrating livestock, contributing to food security and system resilience.

Central to the DVRPU approach are water-spreading weirs (WSWs), dry-stone measures (DSMs) and gabions as well as the plantation of suitable species for stabilisation of the structures, which collectively slow floodwaters, recharge groundwater and create fertile land through the sediment that accumulates in front of the barrier. Since 2015, these types of constructions have been built through collaboration between local governance, different

local communities and NGOs in the lowlands of Ethiopia, while Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is seeing to technical backstopping for the implementation and trains trainers who further share the knowledge to boost technical expertise, thus promoting upscaling. Since the beginning of the collaboration, hundreds of WSWs have been constructed in three regions of Ethiopia's lowlands (Afar, Oromia and Somali) expanding cultivation areas over thousands of hectares. The integration of WSWs has proven beneficial for agro-pastoralists, leading to substantial biomass and grain production as well as visible rangeland recovery and mitigating soil erosion.

A seven-step process

The DVRPU approach is implemented through a seven-step process. It begins with satellite identification and delineation, using satellite imagery to assess and delineate suitable dry valleys. This is followed by a suitability assessment, which involves on-site ground-truth-

ing. If the results are promising, the local community is engaged through sensitisation and participatory planning. Once the community is convinced of the approach, watershed user cooperatives (WUC) are established. These are community-formed, legalised groups responsible for managing and utilising the rehabilitated area's natural resources through democratic decision-making processes. The cooperative agency, guided by government proclamations, supervises the WUCs, providing training, capacity-building initiatives and regular audits to ensure transparency and accountability. Once the technical and budgetary plans have been

Protected/rehabilitated area

Afar: 42,961 ha protected, of which 29,870 ha rehabilitated

Somali: 1,641 ha protected as well as 9,548 ha rehabilitated

Oromia: 1,293 protected, of which 176 ha rehabilitated



Local communities collaboratively building water-spreading weirs to manage floods and restore degraded lands.



A completed water-spreading weir structure, showcasing its ability to slow floodwaters, recharge groundwater, and prevent soil erosion.



Thriving crops cultivated under the water-spreading weir technique.

Photo: Klaus Wohlmann/GIZ

finalised and approved, the next step with the construction of the land rehabilitation measures can be initiated. This involves the physical implementation of the plans, where the community, partners and technical team work together to execute the various measures designed to rehabilitate the dry valley. The implementation of biological and physical measures, such as masonry structures or loose stone structures, relies on the active involvement of the community, which strengthens the sense of ownership and contributes to the long-term success and sustainability of DVRPU.

This participatory approach allows local community members to utilise their knowledge of the landscape, making their contribution invaluable in planning and construction. After two floods, the final steps include technical and budgetary planning, construction and the ultimate productive use of the rehabilitated land. Collaboration between communities, technical experts and local governance is vital for the long-term sustainability of the intervention, fostering active involvement in planning, implementation, maintenance and utilisation of the rehabilitated lands.

A multitude of benefits

To effectively combat erosion, it is essential to consider the entire valley, from its upper to its lower parts. All zones fulfil a function in protecting the valley, while also contributing to economic diversification. Stabilisation of the upper part is critical to reduce water velocity, increase water infiltration and prevent further erosion. As mentioned before, rehabilitation efforts there are focused on check dams and dry-stone measures, complemented by biological measures such as cover crops and afforestation. The physical and biological measures regulate the floods descending from the highlands, transforming them into beneficial resources. The structures spread the floods to the adjacent rangelands. As results, the biomass production of the treated areas increases three- to fourfold. This brings new business

opportunities, integrating pastoral communities into the national economy and reducing out-migration.

The socio-economic impacts

The diverse positive impacts of the DVRPU approach on participating communities, encompassing unity, flood management, economic development and improved health outcomes, are evident. Through the implementation of the approach, 55,619 ha is protected and/or rehabilitated (see Box), with a total of 555 WSWs, transforming land into productive areas, and contributing to food security for thousands of individuals in each dry valley. Despite the initial perceived cost of WSWs, the DVRPU has proven to be cost-effective, yielding positive returns within the second year. Each cascade of 8 to 12 weirs can make an area ranging from 176 to 264 hectares productive. Research conducted in Afar Region in 2018 by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) showcased the DVRPU's potential, particularly in maize production, with an average yield of 4,200 kg/ha. This exceeds the national average for Ethiopia (3,900 kg/ha). With such yields, one rehabilitated dry valley could feed about 6,000 people through the year, showing the potential cereal production in the Horn of Africa holds. This sustainable approach bears significant potential to enhance agro-pastoralist livelihoods and increase food production for local markets, even in the absence of viable rangelands. Stimulating the demand for quality seeds and prompting the establishment of agricultural input centres, it also catalyses income growth by fostering thriving value chains. As agricultural production expands, a robust transport and processing industry emerges, positively impacting the entire agricultural sector and contributing to sustainable development across the Horn of Africa.

The environmental impacts

As previously described, the implementation of the approach offers numerous advantages in soil and water management. Firstly, it enhances soil moisture, creating fertile lands for sus-

tainable agriculture. Secondly, it aids carbon sequestration and increases soil organic carbon, combating climate change. Thirdly, it boosts groundwater replenishment, ensuring consistent water supply for domestic and livestock needs. Additionally, DVRPU facilitates shallow well establishment for efficient irrigation, optimising water use and crop yields. It also mitigates flood damage, enhancing water resource management sustainability. Moreover, DVRPU enables crop cultivation with minimal inputs, mitigates salinity and acidification risks, and promotes crop diversification for economic prosperity. It establishes resilient agroecological systems, acting as natural pest barriers and enhancing rainfed agriculture resilience. Biological measures to enhance the health and productivity of the land, including cover crops and afforestation, maintain physical structures, reduce runoff and improve soil fertility.

In conclusion, the combination of community organisation, flood-based farming and water harvesting techniques in the DVRPU approach provides practical and effective solutions to challenges posed by floods on soil erosion and enhances the productive use of land. Benefiting agro-pastoral communities in the Horn of Africa, DVRPU is a cost-effective solution for similar landscapes. Its scalability is evident beyond Ethiopia, addressing land and water management challenges across the region.

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