

REST's 3-R Approach to Natural Resource Management

The TOPS Agriculture and Natural Resource Management Case Study Series

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Relief Society of Tigray (REST) is operating a USAID Office of Food for Peace (FFP)-funded Development Food Security Activity as part of the Ethiopian government's Productive Safety Net Programme (PSNP).¹ One priority of the REST PSNP activities is rehabilitating and recharging the natural resources of Tigray, Ethiopia. Towards this effort, REST is currently implementing public works and resource transfer activities in 12 woredas, or districts, in Tigray.

Situated in northern Ethiopia, Tigray has one of the country's poorest economies and has long suffered from chronic and transitory food insecurity. It is a semi-arid and arid region consisting of complex landforms dominated by rugged mountain plateaus and deep gorges. Rainfall is sparse, erratic, and increasingly unpredictable due to intensifying climate changes. The location, terrain, and environment play a critical role in the success of Tigray becoming food secure.



Sketch of Daereka Watershed prepared by the community watershed management committee. *Photo credit: REST*



Determinants of Food Insecurity in Tigray, Ethiopia

Natural resources are at the core of several root causes of food insecurity in Tigray, and although there has been progress towards natural resource regeneration in the region over the past two decades, the natural resource base in Tigray needs to improve in order to support the growing population. From 2010 to 2015, crop yields increased,² but analyses indicated that yield increase was primarily driven by favorable weather conditions and that agricultural productivity had no significant change.

¹ The PSNP is one of the Government of Ethiopia's flagship programs to transfer cash or food to beneficiaries.

² Ethiopia Bellman Analysis 2015/2016 and Reassessment of Crop Production and Marketing for 2014/15.

<https://www.usaid.gov/sites/default/files/documents/1866/Bellmon%20FY15-16%20Final%20Report%2019%20October%202015.pdf>

The few years of favorable weather conditions were followed by two years of drought, causing productivity to dip.^{3,4} Farmers' reliance on rain-fed agriculture and limited ability to invest in diversification and productivity measures such as water harvesting structures and irrigation led to low levels of agricultural growth and productivity. Simultaneously, individuals and communities were not investing in natural resource management activities, resulting in severe ecosystem degradation.

Today, soil erosion and loss of ground cover are prevalent in the region. Population growth, livestock grazing, and fuelwood needs increasingly diminish the available natural resources. The region often faces climate-related shocks and stresses,⁵ and it has limited resilience capacities or technologies to withstand the effects. Droughts and floods are common environmental shocks that impact natural resource availability and production, and gradual temperature changes and precipitation variability continue to change the context for farmers. Therefore, rehabilitating and growing the natural resource base is critical to achieving food security in Tigray.

Impact on Natural Resource Health

For the past two decades, environmental rehabilitation has been a key focus of REST's development work in Tigray. Watersheds have been at the center of its approach, and positive changes are visible in the health of the watersheds and natural resources. By focusing on training community members in natural resource management, reclaiming large gullies, and integrating soil and water conservation practices into water catchment sites, REST was able to improve the natural resource base on over 100,000 hectares⁶ of land during the previous USAID/FFP program.

Figure 1 shows the difference in natural resource health of a gully in the Daereka Watershed in the Ahferom woreda before and after REST's reclamation work. Integrating check dams and trench bunds enabled improved water capture in the gully resulting in improved vegetation growth.



Figure 1: Tigray Gully Reclamation—Before (2010) and After (2014) Photo credit: REST

³ USAID/Ethiopia Agricultural Knowledge, Learning, Documentation and Policy Project. 2016. *Food Security in Ethiopia in 2016: Analysing Crop Production and Market Function after the main Meher Agricultural Season*. <http://www.agri-learning-ethiopia.org/wp-content/uploads/2016/06/AKLDP-El-Nino-Review-March-2016.pdf>

⁴ USAID/Ethiopia Agricultural Knowledge, Learning, Documentation and Policy Project. 2016. *El Niño in Ethiopia, 2015-2016 A real-time Review of Impacts and Responses*. <http://www.agri-learning-ethiopia.org/wp-content/uploads/2016/06/AKLDP-El-Nino-Review-March-2016.pdf>

⁵ International Food Policy Research Institute. 2012 *East African Agriculture and Climate Change: A Comprehensive Analysis-Ethiopia* http://reliefweb.int/sites/reliefweb.int/files/resources/aaccs_ethiopia_note.pdf

⁶ Data from the REST FY2016 IPTT

Over the years, REST used Geographic Information System (GIS) mapping to track changes in vegetation across the woredas in Tigray. Figure 2 shows the vegetation coverage in 2011 and in 2017 for the Endagewergish watershed in the Seharti Samre woreda. The 2017 map was captured after two years of drought; even so, vegetation increased between 2011 and 2017 due to REST’s rehabilitation work.

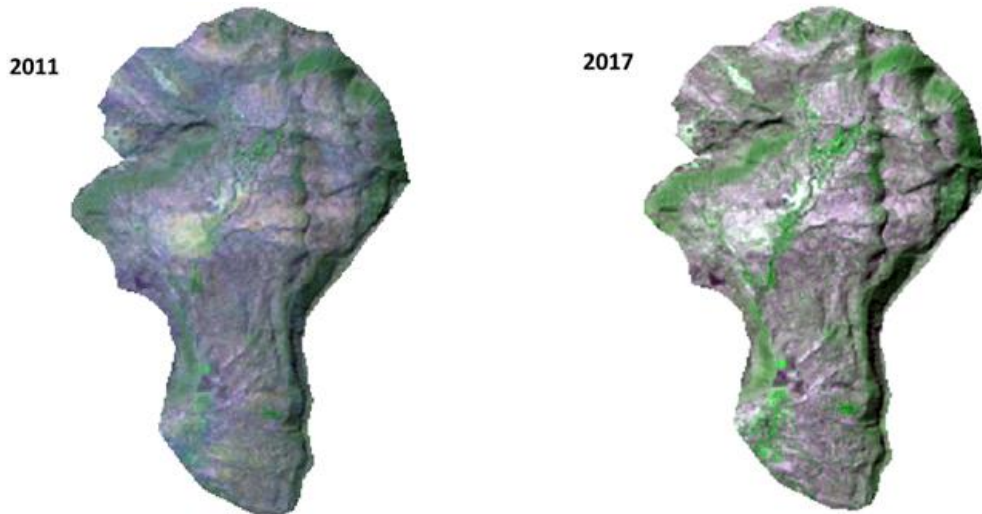


Figure 2: Vegetation from 2011 to 2017 in Endagewergish Watershed

REST 3-R Concept for Natural Resource Management

REST addresses natural resource issues through its 3-R concept, a systemic approach to build natural resources through *Reducing runoff*, *Recharging ground water*, and *Reusing water*. The 3-R approach leads communities to a selection of appropriate interventions that allow access to water during dry periods. Implementation begins at the top of the watershed and moves downhill, layering many different soil and water conservation measures throughout the watershed.

R-1: Reduce runoff. The first ‘R’ focuses on slowing the water at the top of the watershed. These practices reduce the destructive force of water, including soil erosion, to create conditions that are more favorable for tree and agriculture growth. Water can more easily be diverted from the main water pathways into small reservoirs at the top of the watershed. These require farmers to use less energy than when the water reaches the bottom of the watershed and must be pumped against gravity.

Practices include:

- *Soil and water terraces*—conservation structures to slow water movement including hillside terraces, bench terraces, stone bunds, trench bunds, micro-basins, and cutoff drains
- *Gully rehabilitation*—building gabions, trenches, and check dams in gullies
- *Biological conservation measures*—various biological responses to reduce runoff and increase water retention through sowing grass, trees, and other vegetative material

R-2: Recharge ground water. The second ‘R’ focuses on maximizing rainfall infiltration in order to improve groundwater recharge and soil moisture replenishment. Practices include:

- *Percolation structures*—channels, ponds, deep trenches, and pits placed to capture water and allow it sink into the ground

- *River diversion*—a trench that diverts water from a river to irrigable land
- *Mini-dams for irrigation*—earthen embankments constructed across the gorge to harvest runoff
- *Spate irrigation schemes*⁷—diversion from a temporarily flooded piece of land
- *Check dam ponds*—construction across gullies or streams to harvest upstream water

R-3: Reuse water. The third ‘R’ focuses on working with communities to access and use the water managed through the first 2 Rs. For example, providing finance opportunities to access technologies to utilize the water at the bottom of the watershed for drinking and irrigation purposes.

Lessons Learned on How to Implement the 3-R Approach

Understanding the fundamentals of natural resource management and different practices around reducing runoff, as well as recharging and reusing water, is only part of the equation of successful rehabilitation of watersheds. The second-most critical component is how to design and implement natural resource management activities.⁸ REST incorporates lessons from the Ministry of Agriculture and Rural Development to form the principles of their implementation guide:

- Create integrated and sustainable watershed management through forming relationships between land, water, and plant resources in communities. REST underpins all Tigray PSNP activities by integrating as many practices in the watershed as possible.
- Use demand-driven and participatory approaches by keeping the communities at the center of implementation. Participant needs, preferences, and capacities drive the direction of the activities. The participatory approach focuses on youth—particularly landless—and women, who together constitute 60 percent of Tigray’s chronically food insecure population.
- Build upon local knowledge and innovations to improve existing technologies and capacity to adapt to a changing climate. There is already a wealth of knowledge and experience rooted in communities. REST realizes it is easier to work with local innovations to create change rather than only pushing new ideas.

REST understands that effective natural resource management is a balance of strong technical activities and the active role of the community in the process of rehabilitation. For more information about REST’s natural resource management activities, please contact Samson Abrha or Haftay Tsegay.

The TOPS Program

The Technical and Operational Performance Support (TOPS) Program is the USAID/Food for Peace-funded learning and knowledge management initiative, bringing the highest quality information, knowledge, and promising practices in food assistance programming to implementers and donors around the world to ensure more communities and households benefit from the U.S. Government’s investments to fight global hunger.

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⁷ M. G. Hiben and T. G. Embaye. 2014 *Spate Irrigation in Tigray: The Challenges and Suggested Ways to Overcome Them*. International Water Management Institute

⁸ Lakew Desta, Carucci, V., Asrat Wendem-Ageñehu and Yitayew Abebe (eds). 2005. *Community Based Participatory Watershed Development: A Guideline*. Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia.