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Four decades of nature-based solutions at landscape levels in semi-arid region of northern Ethiopia: practices and impacts

KIFLE WOLDEAREGAY¹, LULSEGED TAMENE²

¹*Mekelle University, Ethiopia, School of Earth Science, Ethiopia*

²*CGIAR System Organization,*

Abstract

Land degradation and rainfall variability remain global challenges. In recent years there is a growing attention on nature-based solutions (NbS) to address effects of climate change. The northern Ethiopia, focus of this study, has been known for land degradation, droughts, food insecurity, and even famine (1984/85). In 2021–2022 the region was also affected by armed-conflict which resulted in one of the worst humanitarian crises. The region has been implementing integrated landscape management (ILM), small-scale water harvesting (SSWH) (e.g. check-dams, ponds, river/flood diversions, etc), dams, and groundwater development at scale for over four decades. We have been documenting and monitoring the performances and impacts of the implemented interventions for 30 years (1995–2025) in five representative watersheds. The study involved: (i) inventory of the implemented interventions, (ii) hydrological monitoring: groundwater levels in wells, suspended sediment concentration in streams/rivers, and discharges of streams/rivers and springs, (iii) assessments of effects on livelihoods, and (iv) assessments of emerging challenges. Our study revealed that though different efforts have been made since the 1970s, the implementations have varied over the years (scale, types, approaches, and impacts)-broadly categorised into five phases: Phase I (1970–1985) - soil and water conservations (SWC) mainly at farm levels; Phase II (1985–1995) - catchment level SWC with some SSWH; Phase III (1995–2010) – ILM, SSWH, dams, groundwater development, and promotion of small-scale irrigation at scale; Phase IV (2010–2020) - upscaling ILM, SSWH, dams, groundwater development, and livelihood diversification; and Phase V (2021–2025) – demand (by local community) and private-sector driven water resources development and agricultural intensification. The earlier phases (Phase I and II) were associated with limited success while the later phases (especially phases III and IV) were more successful as more focus was given to integrated approaches - resulting in: enhanced water availability; improved groundwater quality; reduced erosion and sediment delivery to streams/rivers; and enhanced livelihoods. The implementation of complementary and NbS interventions at landscape levels over the years have not only enhanced water availability, livelihoods and environmental management but also buffered effects of worst crises (droughts and armed-conflicts) in such semi-arid area; a lesson for promoting resilience at landscape levels.

Keywords: Climate change, groundwater recharge, landscape restoration, nature-based solutions, water management

Contact Address: Kifle Woldearegay, Mekelle University, Ethiopia, School of Earth Science, Endayesus, P.O.Ox 231 Mekelle, Ethiopia, e-mail: kiflewold@gmail.com