Abstract

In African drylands, perennial grasses preferred by grazing livestock are disappearing at an alarming rate. This has led to recurrent livestock feed shortages threatening pastoralist's livelihoods. Combining native grass reseeding and rainwater harvesting ofers a viable and innovative solution to reverse this trend. However, studies to determine how biomass yields are afected by soil moisture availability attributed to in situ rainwater harvesting in African drylands are limited. We investigated how biomass yields of three grasses native to Africa, i.e., Enteropogon macrostachyus (Bush rye grass), Cenchrus ciliaris (African foxtail grass), and Eragrostis superba (Maasai love grass), are afected by soil moisture content in a typical semi-arid landscape. Rainwater harvesting structures included trenches, micro-catchments and furrows. Additionally, rain runof was diverted from an adjacent road used as a catchment area. Soil moisture was measured between November 2018 and August 2019 using PlantCare Mini-Logger sensors installed at 40 and 50 cm depths and 0, 1, 5 and 15 m away from the trench. Quadrat method was used to determine biomass yields in August 2019. Peaks in soil moisture were observed after rainfall events. Soil moisture content gradually decreased after the rainy season, but was higher closer to the trench. This is attributed to the prolonged rainwater retention in the trenches. Biomass yields were in the order Eragrostis superba>Cenchrus ciliaris>Enteropogon macrostachyus. Biomass production was higher near the trenches for all the studied species. Sensitivity to soil moisture demonstrated by the magnitude to yield reduction during the growing season was in the order Eragrostis superba>Cenchrus ciliaris>Enteropogon macrostachyus. These results suggest that Eragrostis superba is more sensitive to drought stress than Enteropogon macrostachyus that is adapted to a wide range of soil moisture conditions. We demonstrated that in situ rainwater harvesting structures enhanced soil moisture availability and displayed great potential for revegetating denuded natural rangelands in semi-arid African landscapes. Thus, combining rainwater harvesting and reseeding techniques can produce measurable improvements in pastoral livelihoods and should be incorporated in dryland development policies in the region. Ultimately, incorporating such innovative strategies can strengthen the efectiveness of ecological restoration in African drylands to meet the objectives of the UN Decade on Ecosystem Restoration and achieving the UN Sustainable Development Goals.