

Watershed rehabilitation using rainwater harvesting and shrub establishment methods in Northern Afghanistan

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Poster

Abstract

Watershed rangelands in Northern Afghanistan provide various ecosystem services that support the livelihoods of local people, but they are now highly degraded essentially due to the continuous high grazing pressure and recurrent droughts. Effects of shrub establishment method enhanced by water harvesting techniques to rehabilitate degraded rangelands have not been well addressed. Therefore, the objective of this study was to evaluate the impact of direct seeding and transplanting of seedlings in combination with semi-circular bunds on growth, yield, and survival rate of four shrub species (*Atriplex halimus*, *Atriplex nummularia*, *Atriplex lentiformis*, and *Maireana brevifolia*). The results showed that growth attributes and biomass production of shrubs were consistently greater in the transplanting compared to direct seeding. On average, the plant length, width, height, volume, cover, and biomass production of transplanted shrubs were greater than direct-seeded shrubs by 24.3, 8.6, 8.7, 121.5, 13.8 and 34.1%, respectively. Transplantation of seedlings improved the biomass production and growth particularly for *A. nummularia* and *A. halimus*. Biomass production of transplanted seedlings was highest for *A. nummularia* (1313.5 g DM/plant) and *A. halimus* (800 g DM/plant). There was a strong correlation between plant biomass production and volume ($R^2_{\text{Plant volume}} = 0.88$) for the shrub *A. nummularia*, indicating that plant volume is a key variable for assessing biomass production for these species. Additionally, survival rate was greater (100%) in transplanting versus direct seeding (67%) for *Atriplex* species. However, the survival rate of *M. brevifolia* was 100% in both planting methods, suggesting that based on better survival this halophytic plant has great potential when restoring degraded rangelands. Collectively, on the basis of better growth rates, yield, and survival, transplanting *A. nummularia* and *A. halimus* may enhance shrub establishment and contribute to the rehabilitation of degraded areas.