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Mapping mobility barriers in pastoral rangelands: Assessing the impact of *Prosopis juliflora* invasion on access to grazing and water resources

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Abstract

Pastoral livelihoods depend on the ability of livestock and herders to move freely across rangelands to reach grazing areas and water. In many dryland regions, however, the rapid spread of the invasive tree *Prosopis juliflora* is transforming rangeland landscapes. Dense thickets formed by this species can block livestock movement, reduce access to resources, and alter traditional grazing routes. Despite growing concern about its ecological and livelihood impacts, the spatial extent to which *Prosopis* invasion limits access to key pastoral resources remains poorly understood. This study uses geospatial analysis to assess how *P. juliflora* expansion affects access to grazing areas and water points in pastoral rangelands of Ethiopia. Satellite imagery from Sentinel-2 was used to map the distribution of *Prosopis* across the landscape using a machine-learning classification approach. These maps were combined with spatial data on water points, grazing areas, and road networks derived from participatory mapping exercises and existing datasets. Overlay and buffer analyses were then used to identify locations where *Prosopis* thickets intersect with movement routes or occur near critical pastoral resources. Initial results show that several grazing areas and water points are located within zones increasingly affected by *Prosopis* invasion, indicating potential barriers to livestock mobility. Mapping these hotspots provides new insights into how invasive species can reshape pastoral landscapes and influence resource accessibility. The approach demonstrates how satellite data and local spatial knowledge can be combined to support rangeland monitoring and guide targeted management and restoration efforts.

Keywords: Geospatial , invasive species, livestock, local knowledge, participatory mapping, rangelands

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