Rangeland Afforestation is not a Viable Climate Change Mitigation Strategy

A contribution to the public consultations of the Integrity Council for Voluntary Carbon Markets (IC-VCM)

Carbon markets, whether voluntary or not, are increasingly looking at afforestation and reforestation for green carbon capture. Decades of tree plantation experience have shown how to do it right – and where tree planting can cause more harm than benefit. Grasslands, savannas and other rangeland ecosystems appear "open" and "bare"— but this does not mean that they have no value. On the contrary, they have immense intrinsic value and are not appropriate for afforestation.

Following IPCC´s Guidelines, afforestation is defined as the "planting of *new* forests on lands which, *historically*, have not contained forests" [1]. The vast majority of rangelands targeted for tree planting have not previously been forested. Planting large areas of trees in these systems constitutes afforestation, which is not a natural ecological process, unlike reforestation or forest restoration [2]. Nearly 40% of the global land area targeted as suitable for tree planting is unable to provide sufficient water for tree growth from precipitation alone [3]. Tree planting in these regions has resulted in extensive planting failures and ineffective resource investments [4].

Investment guidelines for the voluntary carbon market need to recognize rangelands—grassland, shrub-steppe, savanna, shrubland, and woodland ecosystems that cover approximately one-half of the Earth's land area—for the critically important ecosystem services that they provide at local, regional and global scales [5]. Locally, rangelands provide food and habitat for wild and domestic herbivores, support pastoral livelihoods and hold immense cultural and economic value for the diverse groups of people, including IPLCs (Indigenous Peoples and Local Communities), who live in and manage them.

Healthy rangelands have high infiltration and low evapotranspiration rates compared to forests, which makes them important for streamflow and hence water provision downstream. They also store carbon mostly in the soil and harbor biodiversity above and below ground, and regulate climate through their high albedo (being lighter in color than forest, rangeland vegetation reflects rather than absorbs heat radiation, thus contributing to global cooling).

Rangelands represent a massive carbon pool that accounts for approximately 30% of total terrestrial carbon storage [6]. The carbon sequestration potential of rangeland afforestation has been greatly overstated because existing rangeland carbon storage is often excluded [7]. A large proportion of rangeland carbon storage occurs belowground in roots and soils, where it is stable and resilient to fire and grazing, but very sensitive to soil disturbance [8]. The aerial biomass of a grassland lost in a fire recovers rapidly during subsequent growing seasons. In contrast, tree plantations store most carbon above ground, where it is vulnerable to catastrophic loss by wildfires, pathogens and drought - disturbances that are becoming increasingly frequent and widespread under climate change [9,10].

Rangeland afforestation is not a viable strategy for climate change mitigation because it sequesters little additional carbon and may even lead to a net loss of carbon [11], while it degrades valuable rangeland biodiversity and ecosystem services such as forage provision. Commercial tree plantations in particular sequester far less carbon than native forests and hold little more carbon, on average, than the land cleared to plant them [12]. When plantations replace rangelands, they decrease biodiversity (fauna and flora), streamflow and albedo, and increase wildfire risk, while adversely affecting the livelihoods of people depending on livestock and wildlife [13,14].

Rangelands support the livelihoods of many millions of pastoralists and agropastoralists, and provide a critical source of food security and sovereignty through the production of animal products. Benefits and costs of rangeland afforestation to local communities are seldom accurately evaluated because projects primarily emphasize the technical goals of numbers of trees planted, hectares restored, and people trained [15].

The greatest climate change mitigation potential for rangelands resides in the conservation of existing carbon stores and biodiversity, judicious management of rangelands based on the natural disturbance regimes of grazing and fire, and restoration of degraded rangelands with grasses, forbs, shrubs and scattered trees [16] while also stabilizing the soils. This will also allow rangelands to generate multiple ecosystem services while retaining their potential for adaptation and resilience to global change, especially where this results in more variable and less productive climates that make forestry and crop production more marginal and risky.

We call on the IC-VCM to adopt a reasoned and science-based approach and methodology to carbon capture in rangelands.

On behalf of the Global Coordinating Group (GCG) of the International Year of Rangelands and Pastoralists (IYRP 2026)

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