Rangelands and Climate Change: Mitigation, Adaptation and Co-benefits

World Agroforestry Centre

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RANGELANDS REPRESENT 24% OF THE WORLD'S LAND AREA AND ARE AN IRREPLACEABLE SOURCE OF LIVELIHOODS FOR THE POOR

Rangelands directly support 200 million households and support 50% of the world's livestock population. Livestock, which greatly depend on rangelands for their growth, are socially, culturally and economically critical to rural livelihoods. Livestock is a fast-growing agricultural sub-sector, accounting for as much as 50% of GDP in countries with significant areas of rangeland (World Bank, 2007). Pastoralism is considered the most appropriate strategy to maintain human well-being in rangelands, as it provides secure livelihoods, conserves ecosystem services, promotes wildlife conservation and honours cultural values and traditions (ILRI, 2006; UNDP, 2006). However, managers of rangelands face socio-political constraints - for example tenure insecurity, lack of social and education services, and conflicting policies have exacerbated their societal marginalization and economic poverty.

LIVESTOCK GRAZING SYSTEMS CAN HAVE A NEGATIVE IMPACT ON THE ENVIRONMENT AND CLIMATE CHANGE

Globally, 10–20% of drylands, and 31% of African rangeland soils, are degraded (MEA, 2005; (Oldeman 1994). Unsustainable grazing management, fire and land-conversion are important drivers of degradation and GHG emissions. Grazing-induced desertification severely impacts biological diversity, and is estimated to emit 8.2 MT-C.yr-1 (FAO/LEAD, 2006) globally, while savannahs contribute 42% of the total carbon released from biomass burning (Levine et al., 1999; Andreae, 1991). The conversion of rangelands to cropland, including biofuel production, may result in a loss of 95% aboveground and up to 60% below-ground carbon (Reid et al., 2004; Guo and Gifford, 2002). Further degradation leaves bare ground, which reduces the effectiveness of the conversion of rainfall in primary production by 50-70%. Climate change induced shorter crop growing seasons may lead to abandoning of cropland and increase the area under rangelands in the future (Jones and Thornton, 2008).

IMPROVED GRAZING MANAGEMENT, REVERSING DEGRADATION, AND AGROFORESTRY ARE THE MOST IMPORTANT TECHNICAL MITIGATION SOLUTIONS (IPCC, 2007)

Grazing management techniques intended to increase forage production through increased perennial species have the potential to increase above and below ground soil carbon stocks, and to restore degraded drylands. Rangelands store 30% of the world's soil carbon (White, 2000; Grace et al. 2006). Smith et al. (2007) estimated that improved rangeland management could globally sequester 0.35–0.55 Gt-C.yr^{-1} up to 2030. Batjes (2004) estimated that improved management of 10% of the African grazing lands could increase soil carbon stocks by 13-28 Mt-C.yr^{-1}. Natural or improved fallow systems, under agroforestry and managed for resting of land, have potential sequestration rates of 0.1–5.3 T-C.ha^{-1}.yr^{-1} (Vagen et al., 2005).

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SOIL AND ABOVE GROUND C SEQUESTRATION HAVE CO-BENEFITS THAT REDUCE VULNERABILITY

Sustainable grazing practices can stimulate diverse plant communities and the development of healthy root systems, feed both livestock and soil biota, maintain plant cover at all times, and promote natural soil forming processes. Greater soil carbon increases adaptation capacity through improving soil physical properties (e.g. improved structural stability, erosion resistance, water-holding capacity and aeration), chemical properties (e.g. enhanced availability of micronutrients) and biological properties (e.g. enhanced faunal activity and species diversity) (Lal, 2004; FAO, 1995). These lead to greater forage production, and enhanced profitability, as well as the rehabilitation of degraded lands and the restoration of ecosystem services (water, biological diversity and land health). The risks associated with prolonged drought periods and unreliable rains can be offset by the increased water infiltration and retention associated with organic matter accumulation in the soil.

WITH DURBAN (UNFCCC COP-17) AND RIO+20 ON THE HORIZON, THERE ARE A NUMBER OF PRIORITY ACTIONS THAT NEED TO BE UNDERTAKEN TO CAPITALIZE ON THE POTENTIAL BENEFITS OF EFFECTIVE, INTEGRATED ADAPTATION AND MITIGATION STRATEGIES IN DRYLAND GRAZING SYSTEMS

- Take stock of the state of knowledge of the lower and upper limits of the potential for rangelands to sequester carbon above and below ground, through improved grazing management, establishment of perennial species (grasses, trees, shrubs), and by reversing degradation over the next 20 to 40 years.
- Establish alternative future scenarios for dryland rangelands, taking into account carbon gaps, anticipated climatic shifts, population, tenure, land use pressures, trade-offs, different management strategies and alternative policy scenarios.
- Create an awareness campaign at local, national and international levels demonstrating the multifunctional contribution of dryland grazing systems to livelihoods and mitigation and adaptation of climate change.
- Promote the implementation of grazing management systems that provide a cover of productive grasses, legumes and multipurpose trees that build carbon stocks and biological communities, re-establish effective water cycles, and manage livestock-based nutrients, while improving livestock keepers' livelihoods.
- Support action research priority areas and capacity needs to establish a deeper evidence base, develop appropriate monitoring, reporting and verification (MRV) systems in order to promote implementation of best practices that maximize ecosystem processes and sustainable livelihoods at a landscape level.
- Implement best practices to maximize ecosystem processes and sustainable livelihoods at a landscape level.
- Clarify priority investment strategies for donors and investors and incentive mechanisms for rangeland managers.
- Encourage the application of best practices by pastoralists and other rangeland managers for their private benefit and the welfare of the environment as a whole.

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