



# How much is pastoral ecosystem in northern Kenya contributing to climate change mitigation through carbon sequestration?

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## Research Brief

Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change

### Abstract

*Pastoralism serves as a primary livelihood for many people in northern Kenya. However, governments, under the assumption that pastoralism is environmentally destructive, are discouraging pastoralism as a land use. This assumption, however, is unsupported. Carbon sequestration through sustainable rangeland and livestock management practices could actually help to reduce greenhouse gas emissions and climate change mitigation. This study aims to assess carbon sequestration potential in the semi-arid pastoral ecosystems of northern Kenya by taking into account the spatial and temporal variability of range resources. The data incurred from this study will provide baseline information that can be used to improve pastoral grazing managements for additional carbon sequestration so that pastoralists can participate in a carbon credit trade.* 🐄

### Pastoralism falsely believed to be degrading Kenyan rangelands

Extensive livestock production that employs herd mobility across grazing landscapes is a key livelihood source for people living in northern Kenya. A large proportion of the pastoral population is rated as poor (earning less than 2 dollars a day). Poverty is directly linked to the government's lack of commitment to promoting pastoralism as viable and sustainable land use. Both colonial and even early post-independence governments thought that northern Kenya pastoralists accumulated more herds beyond optimal carrying capacity, resulting in environmental degradation due to continuous grazing. As a result, governments encouraged destocking. However, environmental destruction resulting from pastoralism is rarely substantiated.



*Capturing spatial heterogeneity in the carbon assessment in pastoral ecosystem in northern Kenya. (Photo credit: Bulle Hallo Dabasso.)*



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Through sustainable rangeland and livestock management practices, pastoralism could actually aid in carbon sequestration. Over half of Africa's carbon stocks, or the amount of carbon stored in the environment, can be found in pastoral rangelands. Since pre-industrial times, global CO<sub>2</sub>, one of the Green House Gases (GHGs) contributing to global climate change, has increased by 40 percent. Reduction of CO<sub>2</sub> in the atmosphere is hence considered important in climate change mitigation. The perception of pastoralism as an environmentally destructive livelihood masks the potential of carbon sequestration in pastoral





*Capturing temporal variability in carbon assessment in the pastoral ecosystem of northern Kenya. (Photo credit: Bulle Hallo Dabasso.)*

ecosystems. The few studies that have attempted to estimate carbon sequestration often undertake one-off data assessment in a certain range environment. They hence fail to consider the heterogeneous nature of pastoral ecosystems both in terms of spatial and temporal dimensions. This poses challenges for policy development that promotes pastoralism as a land use that provides carbon sequestration for climate change mitigation. Consequently, there has been a general move away from pastoralism towards other land use types without looking at associated environmental implications. This study aims to assess the potential of carbon sequestration in semi-arid pastoral

ecosystems in northern Kenya by taking into account spatial temporal variability range resources.

### **Heterogeneous landscape selected to determine carbon stocks of woody, herbaceous and soil samples**

Researchers purposively selected Marsabit's central grazing land as a study site because of its spatial heterogeneity in vegetative characteristics. Marsabit's central grazing land is located along the topographical gradient of Marsabit Mountain in northern Kenya. This area has a diverse array of vegetation that consists of grasslands, shrublands and woodlands. It is a semi-arid area with annual rainfall ranging from 400 mm to 750 mm distributed over a long-rainy season (March - May) and short-rainy season (October - December). The prevailing livelihood option is pastoralism, in which cattle, sheep, goats and camels are kept in communal grazing lands.

The site was classified into landscape types depending on vegetation type and systematically assessed for carbon sequestration. Within each landscape type a permanent plot of 400 meters by 400 meters was established using Global Positioning System (GPS). From the center of these permanent plots, researchers laid out transects of 200 meters in an easterly, westerly, northerly and southerly direction. Along these transects, sub plots were laid out at 30-meter intervals. Woody carbon, herbaceous carbon and soil carbon were assessed for each landscape type within its nested sub-plots. Woody carbon was assessed using allometry equations, herbaceous carbon was assessed from oven-dried biomass and soil carbon was determined through an oxidation process. The carbon assessments were done for two consecutive seasons (wet and dry).



*Capturing temporal variability in carbon assessment in the pastoral ecosystem of northern Kenya. (Photo credit: Bulle Hallo Dabasso.)*

## Sustainably managed rangelands can mitigate climate change through carbon sequestration

After data analysis, researchers found that an average of about 1,332 metric tons of carbon dioxide was sequestered on a hectare of land. The sequestration varied with landscape type, affirming the need to consider asymmetric distribution range resources in the assessment of carbon data. The results depict the potential pastoral ecosystems have in mitigating climate change. It is therefore important to consider the ecosystem services associated with pastoral livestock production, including carbon sequestration. If the contribution of pastoral ecosystem in mitigation of climate change is to be maintained, the grazing practices that have helped CO<sub>2</sub> sequestration need to be upheld. Further research is necessary to establish pastoral grazing management practices that will provide additional carbon sequestration and facilitate pastoralists' ability to participate in a carbon credit trade for livelihood diversification and climate change mitigation. 🐄



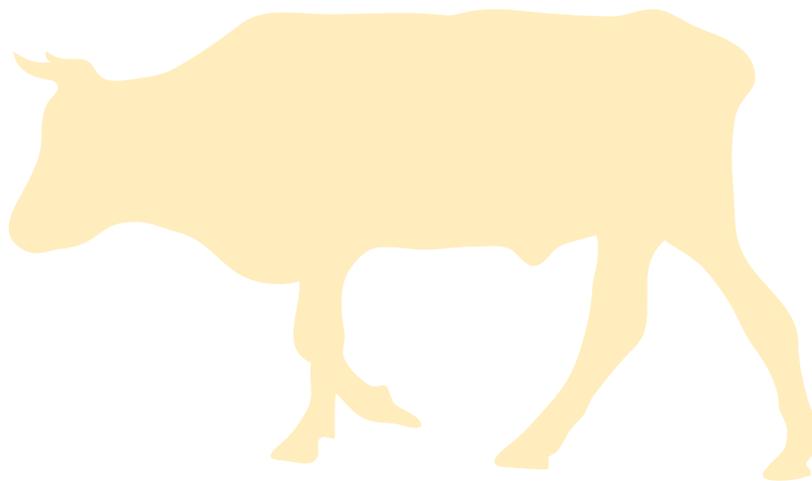
*Sample processing and weighing in laboratory. (Photo credit: Bulle Hallo Dabasso.)*



*Sample recoding. (Photo credit: Bulle Hallo Dabasso.)*

## Further Reading

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*TIRI, Targeted Investment for Research Impact, identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.*

*Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, TIRI scholars are expected to demonstrate concrete outcomes and real potential for future impact. The 10 selected East Africa TIRI scholars and the 18 selected Nepal TIRI scholars are addressing research problems on various livestock and climate research themes.*



**Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change is dedicated to catalyzing and coordinating research that improves the livelihoods of livestock producers affected by climate change by reducing vulnerability and increasing adaptive capacity.**

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