

Chapter 6

LINKING PASTORALISTS TO A HETEROGENEOUS LANDSCAPE

*The Case of Four Maasai Group Ranches in
Kajiado District, Kenya*

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Abstract

Experience gained in looking at land-use change issues over recent decades has shown that human land-use strategies impact and are simultaneously impacted by ecological patterns and processes. In this chapter, we provide an example of a methodology to quantify the linkages between people and environment in a communal resource landscape and detect the impacts of landscape patterns on human land use. Pastoral production strategies in semiarid regions were predicated historically on opportunistic and extensive livestock movements in search of grazing and water across heterogeneous landscapes. However, macroscale political-economic factors that drive land subdivision and economic sedentarization compromise the ability of herders to maintain large-scale and opportunistic grazing patterns by fragmenting the landscape. We used remote sensing, GIS, GPS, and household socioeconomic surveys to: (1) identify a methodology to quantify the ecological heterogeneity of pastoral landscapes in Kajiado District, Kenya, (2) identify the daily spatial scale of pastoral resource use, and (3) illustrate the degree of seasonal variability inherent in this example of a semiarid pastoral system. We defined landscape heterogeneity using NDVI images for wet and dry periods of the year, a 1-km resolution digital elevation model, and a soils layer. We merged heterogeneity layers for wet/dry NDVI, elevation, and soils to form six combinations of heterogeneity indices, then used Monte Carlo assessments to quantify the degree of selection pastoralists made for

landscape heterogeneity. Daily pathways did not reveal selection within seasons. Daily path lengths were related to the degree of subdivision and economic sedentarization of households. Integrating annual grazing pathways into these analyses will be a key to better depicting pastoralists' relationships with landscape heterogeneity.

Keywords: landscape heterogeneity, NDVI, heterogeneity indices, randomization tests, pastoral land use, communal land tenure, subdivision, Maasai Pastoralism, Kenya

1. INTRODUCTION

Over the last several decades, the rate and scale of changes in human land use and land cover have increased dramatically (Turner et al. 1990). Experience has shown that local-level environmental and human-driven processes can have local- to global-level ecological, socioeconomic, and cultural consequences. Teasing apart, the directional effects of humans on their environment and environmental effects on human land-use systems require both understanding and quantification of proximate and ultimate system drivers, causal relationships between variables, and the processes that are at play in molding human-environmental interactions over time and space. The coupling of remotely sensed data to social and ecological data has enabled researchers to define some of the specific processes associated with environmental change and human driving mechanisms (Guyer and Lambin 1993; Geoghegan et al. 1998). However, this research has also produced interesting theoretical and methodological challenges. How to link “people to land” or “land to people” in remote sensing analyses is an ongoing question, particularly in systems where the resource base is communally managed and individual households are not directly connected by ownership or leasehold arrangements to particular areas on the landscape over time. As shown by the chapters included in this volume, there is an increasingly strong history of land-use and land-cover change studies that use social science data and remote sensing methodologies to elucidate and model the impacts of human behavior and land use strategies on land cover and processes of landscape transformation (see also Moran et al. 1994; Skole et al. 1994). But the interactions between human land-use systems and the landscapes in which they are situated go strongly in both directions. Human land-use strategies simultaneously shape and are shaped by ecological patterns and processes, always with wider linkages to existing political-economic drivers.

The aim of this chapter is to provide an example of a methodology to quantify the linkages between people and land in a communal resource landscape and to highlight and identify the directional effects of specific