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Quantifying Declines in Livestock Due to Land Subdivision

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Abstract

In Kajiado District, Kenya, ranches held communally by Maasai are being subdivided into individually owned parcels. Livestock owners know that herds on parcels that are too small cannot be viable, but the decline in the capacity of parcels to support livestock has not been quantified. We used ecosystem modeling to represent the effects of subdivision as Maasai group ranches were divided into 196, 10, 5, 3, and 1 km^2 parcels. Within the spatially explicit, process-based SAVANNA ecosystem model, we used maps that constrained the movements of livestock to be within parcels. We also modeled cooperative grazing associations, giving groups of herders access to parcels composed of dispersed or contiguous 1 km^2 parcels. Vegetatively productive areas had higher carrying capacities when isolated because resident animals did not compete with animals moving in seasonally from other areas. In a ranch of low but heterogeneous productivity, we saw a steady decline in capacity under subdivision, until 25% fewer livestock could be supported on the ranch of 1 km^2 parcels relative to the intact ranch. On a ranch with both low productivity and heterogeneity, 20% fewer livestock were supported when parcels were still 10 km^2. The most productive ranch studied saw small population changes with subdivision. Participation in grazing associations was helpful in the ranch intermediate in productivity and heterogeneity, but not other ranches. Subdivision of Kajiado lands might be inevitable, but our results show the relative benefits to stakeholders if land owners and policy makers act to maintain open or flexible access to individually held parcels.

Resumen

En el Distrito Kajiado, Kenya, los ranchos manejados comunalmente por los Massai están siendo subdivididos en parcelas de propiedad individual. Los propietarios de ganado saben que los hatos en parcelas muy pequeñas no son viables, pero la disminución de la capacidad de las parcelas para sostener el ganado no ha sido cuantificada. Usamos el modelaje de ecosistemas para representar los efectos de la subdivisión de cómo el grupo de ranchos Massai fueron divididos en parcelas de 196, 10, 5, 3 y 1 km^2. Dentro de la explicitud espacial del modelo de ecosistemas SAVANNA, basado en procesos, usamos mapas que limitaban los movimientos del ganado dentro de las parcelas. También modelamos las asociaciones cooperativas de apacentamiento, dando, a grupos de pastores, acceso a parcelas compuestas de parcelas de 1 km^2 dispersas o contiguas. Cuando se aislaron, las áreas vegetativamente productivas tuvieron mayores capacidades de carga animal porque los animales residentes no compitieron con animales moviéndose estacionalmente de otras áreas. En un rancho de productividad baja pero heterogénea, observamos una disminución gradual de su capacidad bajo la subdivisión, hasta que 25% menos del ganado pudo ser sostenido en el rancho de parcelas de 1 km^2 en relación al rancho intacto. En un rancho con baja productividad y heterogeneidad, 20% menos ganado fue soportado aun cuando las parcelas permanecieron de 10 km^2. El rancho más productivo estudiado vio pocos cambios en la población por la subdivisión. La participación en asociaciones de apacentamiento fue útil en el rancho intermedio en productividad y heterogeneidad, pero no los otros ranchos. La subdivisión de las tierras del Kajiado puede ser inevitable, pero nuestros resultados muestran los beneficios relativos para los usuarios, si los propietarios de la tierra y los que dictan las políticas actúan para mantener un acceso abierto o flexible a las parcelas manejadas individualmente.

Key Words: fragmentation, heterogeneity, Kajiado District, Kenya, Maasai, movement, SAVANNA, sedentary

INTRODUCTION

Semi-arid and arid rangelands that are generally too dry to support rain-fed agriculture but have vegetation comprise about 25% of the landscapes of the world, excluding Antarctica (reviewed in Groombridge 1992). Twenty million or more households make their living as pastoralists on these lands, and ten times as many obtain a significant source of income from raising livestock (De Haan et al. 1997). Pastoral livestock inhabit landscapes that are spatially heterogeneous and have forage patches that pulse in their value to animals through time (Pickup and Stafford Smith 1993). Mobile pastoralists evolved

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