

Research Application Summary

**Assessing socio-ecological change dynamics using local knowledge in the semi-arid lowlands of Baringo District, Kenya**

Wasonga, V.O.<sup>1</sup>, Nyariki, D.M.<sup>1</sup> & Kinuthia Ngugi, R.<sup>1</sup>

<sup>1</sup>Department of Land Resource Management and Agricultural Technology, University of Nairobi, P.O. Box 29053-00625, Nairobi, Kenya

Corresponding author: oliverwasonga@uonbi.ac.ke

**Abstract**

A clear understanding of the social and ecological change dynamics in pastoral ecosystems is imperative for formulation of appropriate policies that ensure sustainable resource use and livelihood security of pastoral households. Spatial and temporal ecological knowledge expressed by those with long familiarity with the ecology has been shown to be more superior in quality and resolution than those gathered remotely and modelled digitally. This study adopted a local perceptions approach in assessing the social and ecological change dynamics in the Njempes Flats over a period of 40 years in Baringo, Kenya. The results reveal a changing vegetation structure, declining diversity and increasing soil erosion that are attributed to the rise in both human and livestock populations. The results also show a rising trend in diversification of asset portfolios in response to impoverishment as a result of the declining pasture and livestock productivity. These findings suggest that pastoralism in Baringo is a system in transition, attempting to maintain itself while at the same time trying to adapt progressively to a continuously shrinking resource base.

Key words: Local knowledge, semi-arid lowlands, socio-ecological trends

**Résumé**

Une bonne compréhension de la dynamique du changement social et écologique dans les écosystèmes ruraux est impérative pour la formulation de politiques appropriées qui assurent une utilisation durable des ressources et de la sécurité des moyens de subsistance des ménages ruraux. La connaissance écologique spatio-temporelle exprimée par ceux qui ont une longue familiarité avec l'écologie s'est révélée en qualité et résolution plus supérieure que celle recueillie à distance et modélisée numériquement. Cette étude a adopté une approche locale des perceptions dans l'évaluation de la dynamique du changement social et écologique dans la plaine Njempes sur une période de 40 ans dans le district de Baringo, au Kenya. Les résultats révèlent une structure de la végétation changeante,

une diversité en baisse et l'érosion croissante des sols qui sont attribuées à la hausse à la fois dans les populations humaines et animales. Les résultats montrent également une tendance à la hausse dans la diversification des biens actifs en réponse à l'appauvrissement en raison de la baisse des pâturages et de la productivité du bétail. Ces résultats suggèrent que le pastoralisme dans le district de Baringo est un système en transition, essayant de se maintenir seul tout en essayant en même temps de s'adapter progressivement à une base de ressources continuellement en baisse.

Mots clés: Connaissance locale, plaines semi-arides, tendances socio-écologiques

## Background

Technical advances in the recent past have unequivocally shown that the entire world is undergoing rapid ecological changes at local, regional and global scales (UNEP, 2008), and that the most obvious and pronounced change is caused by human land-use. Most affected are the arid and semi-arid ecosystems owing to their inherent climatic variability that render them more susceptible to land-use pressure than other ecosystems. In Kenya, just like elsewhere in Africa, all factors that undermine pastoralism are believed to be responsible for the man-induced process of land degradation. The degradation of pastoral areas has led to the erosion of the economic livelihood of pastoralists, which is reflected in increased destitution among pastoral households.

## Literature Summary

Maitima *et al.* (2004) points out that the expansion of urban centres from 7% in 1960 to 30% in 2001 is partly responsible for land-use change and range degradation in Kenya. In a study conducted in the semi-arid rangelands of southeast Kajiado District, Kenya, Campbell (2003) reported the expansion of agriculture into critical grazing areas as a result of increase in human population. Kristjanson *et al.* (2002) while working in Kitengela in Kajiado District of Kenya found that considerable social and ecological changes have occurred in the area over the last 40 years. They reported increase in privatisation of land, crop cultivation and livelihood diversification. These social and ecological dynamics bear similarities across rangelands of Eastern Africa and are a cause of concern for the integrity of pastoral ecosystems and livelihoods. This calls for a clear understanding of the dynamics with the aim of formulating appropriate policies to ensure livelihood security and improved well-being of pastoral households.

The spatial and ecological understanding expressed by those with long familiarity with the ecology have been shown to be superior in quality and resolution to those gathered remotely and modelled digitally. Turner and Hiernaux (2002), for example, have demonstrated that maps of livestock activity based on local herder knowledge proved more effective and accurate for management than those rigorously developed through spatial modelling. Similarly, Njoka *et al.* (2004) underscored the importance of investigating change from the people most affected by the change, and who have experienced it over the years. This implies that by incorporating and evaluating such knowledge, researchers come closer to an accurate picture of the overall system and therefore likely to bridge the gap between the rural populace and experts, which is viewed largely as one of communication (Al-Kodmany, 2001). This study adopted a local perception analysis of the socio-ecological trends to explore the longitudinal relationship between land cover and land-use on one hand, and rainfall variability, human and livestock populations on the other hand. The hypotheses of this study were that the social and ecological change dynamics in the Njemps Flats are interlinked, and that local knowledge and perceptions corroborate the conventional information on the socio-ecological trends.

## Study Description

This study was conducted in the Njemps Flats of Baringo District, Kenya. The study area is a semi-arid rangeland located between latitude 00°30N and longitude 36° 00E that falls within agro-climatic zone IV and V, receiving an average rainfall of 500 mm per annum. The average altitude in the Njemps Flats is 900 m above sea level. The main vegetation classes include *Acacia* woodland (80%), permanent swamp and seasonally flooded grassland (15%) and shrub grassland (5%) (Wasonga, 2009). The soils in the Njemps Flats are generally shallow silt loam to clay loam, with low organic matter. The main land-use practice in the study area is livestock production. Sedentary agro-pastoralism is the main land-use on the west, south and eastern parts of the study area, while semi-nomadic pastoralism dominates on the northernwest and northern parts.

A combination of methods was used to collect information in this study. A structured questionnaire was used to obtain specific information on socio-ecological perceptions of the local communities. Based on the land-use system, the study area was divided into two strata namely, sedentary agro-pastoral and semi-nomadic land-use system. A stratified random sampling

procedure as described by Nyariki (2009) was used in data collection. A total of 55 persons were interviewed in each of the two strata. Focus group discussions (FGDs) were used to clarify responses that appeared unclear, and assess if there was a consensus on general social and ecological trends as perceived by the individual respondents. Informal discussions involving key informants with considerable knowledge about issues under investigation were further used to verify the gathered information. This study targeted elderly persons over 60 years of age. Data collected were analyzed using Statistical Package for Social Sciences (SPSS).

**Research Application**

The results of this study reveal a changing vegetation structure, declining plant diversity and herbaceous cover and increasing soil erosion in the past four decades (Fig. 1). These trends are attributed to the land-use pressure associated with rise in both human and livestock populations, in addition to rainfall anomalies. As perceived by the local communities, despite the decline in rain-days, heavy torrents accompanied by floods have become common in the past four decades (Fig. 2). The increasing alternative sources of livelihood in the study area are responses to deprivation due to the declining range productivity and recurrent droughts.

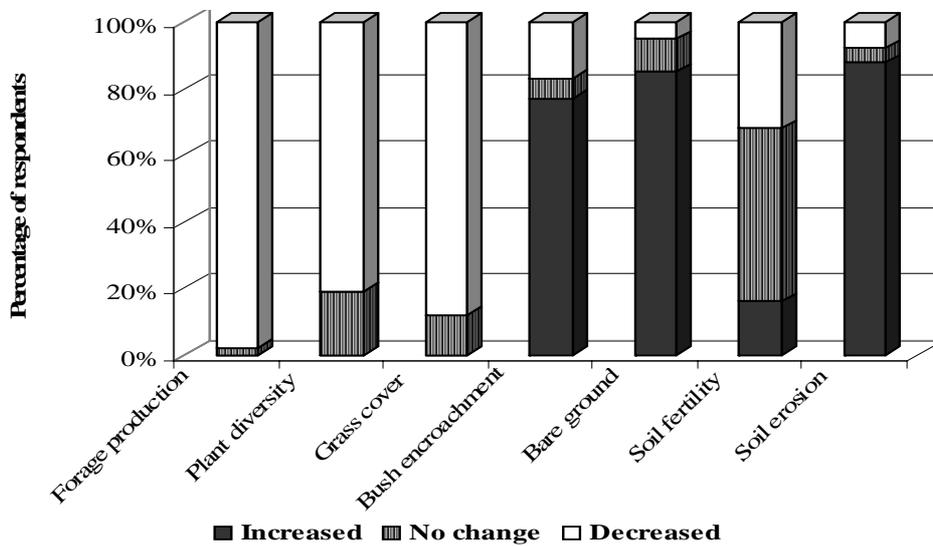
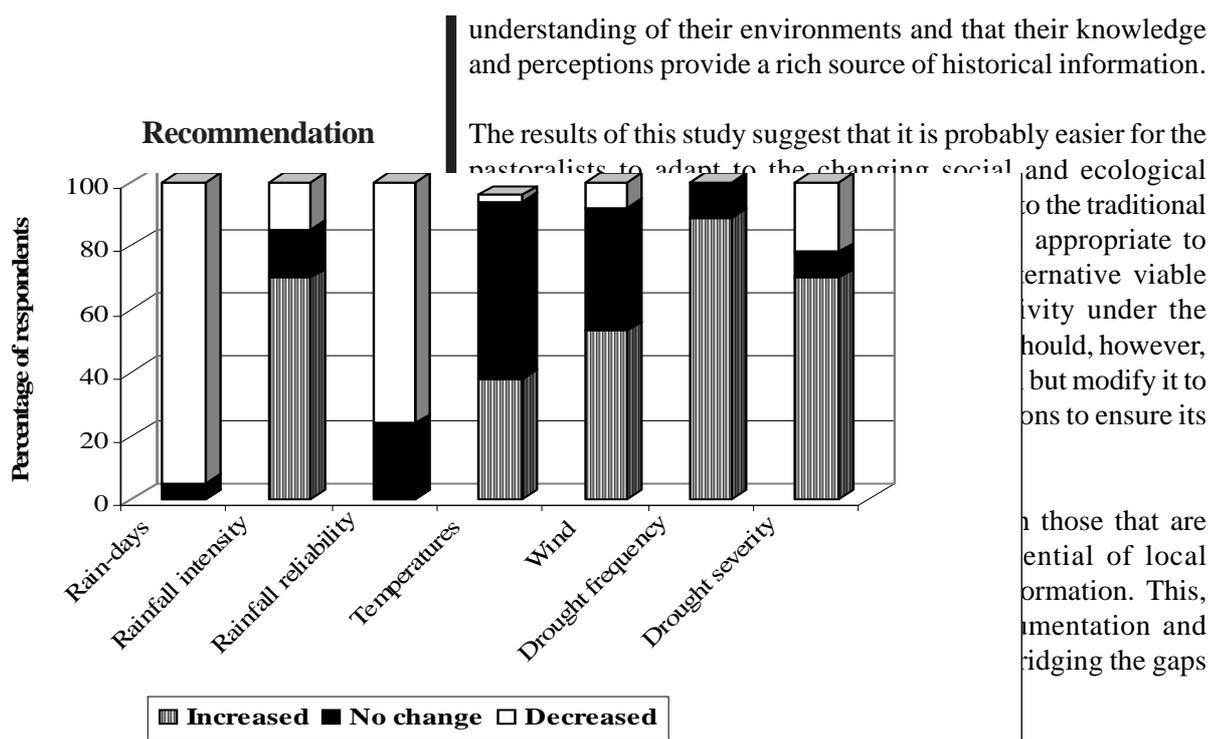


Figure 1. Vegetation and soil change trends in the past 40 years as perceived by local communities.

These findings indicate that pastoralism in Baringo is a system in transition, attempting to maintain itself while at the same time trying to adapt progressively to a continuously shrinking resource base. Overall, this study shows that pastoralists have a good

Figure 2. Climatic trends during the last 40 years as perceived by local communities.



**Acknowledgement**

This research was made possible by funding from the Swedish International Development Co-operation Agency (Sida) through the Pastoral Information Network Programme (PINEP), University of Nairobi. We are grateful to Mr. Philemon Kemei, Laban Labat, Maina Kemei and pastoral communities in the Njemps Flats for their support during this study.

## References

- Al-Kodmany, K. 2001. Bridging the gap between technical and local knowledge: Tools for promoting community-based planning and design. *Journal of Architectural and Planning Research* 18:110- 130.
- Campbell, D.J., Gichohi, H., Reid, R., Mwangi, A. and Chege, L. 2003. Interactions between people and wildlife in south east Kajiado District, Kenya. *LUCID Working Paper Series* No. 18.
- Kristjanson, P., Radeny, M., Nkedianye, D., Kruska, R., Reid, R., Gichohi, H., Atieno, F. and Sanford, R. 2002. Valuing Alternative Land-Use Options in the Kitengela Wildlife Dispersal Area of Kenya. ILRI, Nairobi, Kenya.
- Maitima, J., Reid, R.S., Gachimbi, L.N., Majule, A., Lyaruu, H., Pomeroy, D., Mugatha, S., Mathai, S. and Mugisha, S. 2004. The linkages between land-use change, land degradation
- Njoka, T.J., Muriuki, G.W., Reid, R.S. and Nyariki, D.M. 2004. The use of sociological methods to assess land-use change: A case study of Lambwe Valley, Kenya. *Journal of Social Science* 7(3):181-185.
- Nyariki, D.M. 2009. Household data collection for socio-economic research in agriculture: Approaches and challenges in developing countries. *Journal of Social Sciences* 19(2): 91-99.
- ROK (Republic of Kenya). 2001. Kenya population and census, 1999. Volume I. Central Bureau of Statistics, Ministry of Planning and National Development, Nairobi Kenya.
- Turner, M.D. and Hiernaux, P. 2002. The use of herders' accounts to map livestock activities across agropastoral landscapes in semi-arid Africa. *Journal of Landscape Ecology* 17: 367 - 385.
- UNEP. 2008. Africa Atlas of our changing environment. UNEP. [www.na.unep.net/AfricaAtlas](http://www.na.unep.net/AfricaAtlas).
- Wasonga, V.O. 2009. Linkages between land-use, land degradation and poverty in semi-arid rangelands of Kenya: The case of Baringo District. PhD Thesis, University of Nairobi, Kenya.