

The effect of climate variability and change on forage availability and productivity in Uganda's cattle corridor: A case study of Karamoja sub-region

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Abstract

This study seeks to explore the influence climate variability and change has on forage availability and productivity in Karamoja region of North Eastern Uganda. It will determine forage availability and factors influencing its productivity. It will also establish the relationship between forage availability and livestock population dynamics including; state variables, demographic rates, synthetic demographic rates and the global demographic indicators. The study will also project forage availability in the context of a changing climate for the period 2020-2050. Cross-sectional data, remote sensing and GIS as well biomass assessments through clipping will be used in this study. This study will contribute to livestock early warning systems (LEWS) initiatives and help in the design of appropriate interventions in livestock production, sustainable management of natural resources that support livestock production and as well as contribute to rangeland health monitoring.

Key words: Climate variability and change, Down-scaling, forage productivity, Karamoja-Uganda, livestock early warning systems (LEWS), livestock population dynamics

Résumé

Cette étude vise à explorer l'influence du changement climatique et de sa variabilité sur la disponibilité du fourrage et sa productivité dans la région de Karamoja, au Nord-Est de l'Ouganda. Elle permettra de déterminer la disponibilité du fourrage et les facteurs qui influent sur sa productivité. Elle permettra également d'établir la relation entre la disponibilité du fourrage et la dynamique des populations de bétail, incluant les variables d'état, les taux démographiques, les taux synthétiques démographiques et les indicateurs démographiques globaux. L'étude permettra également de projeter la disponibilité du fourrage dans le contexte du changement climatique pour la période 2020-2050. Les données transversales, la télédétection et le SIG aussi bien les évaluations de la biomasse par échantillonnage

seront utilisés dans cette étude. Cette étude contribuera aux initiatives des systèmes d'alerte précoce du bétail (LEWS) et aidera dans la conception des interventions appropriées dans la production animale, la gestion durable des ressources naturelles que soutient la production animale et ainsi qu'elle contribuera à la surveillance de la santé des terres agricoles.

Mots clés: Variabilité et changement climatiques, réduction à l'échelle, production du fourrage, Karamoja-Ouganda, systèmes d'alerte précoce du bétail (LEWS), dynamique des populations de bétail

Background

Livestock is one of the most important livelihood production systems in dryland Africa. Over 50 million livestock producers across East and West Africa support their families, communities and livestock based industries. Livestock also contributes to about 200 million agro-pastoralists livelihoods in the African continent. In Ethiopia, the livestock sector ranks second to coffee in foreign exchange revenue, pastoral livestock is estimated to be worth USD 800 million in Kenya while in Uganda its share contribution to GDP is estimated at 8.5% (Oxfam, 2008; Rodriguez, 2008; IIED and SOS Sahel, 2009; Gelan *et al.*, 2011). It has also been shown that livestock productivity leads to a greater factor income particularly among poor households (Gelan *et al.*, 2011) such as those in pastoral lands.

Where other land use systems have failed or are failing in the face of global climate change, mobile livestock herding is generating national and regional economic and environmental benefits in the drylands (see Nori *et al.*, 2005; Oxfam, 2008; Hesse, 2009; Nassef *et al.*, 2009). Although the livestock production in these areas is frequently under pressure from climate variability that affects the availability of key livestock production resources especially forage and water, it has nevertheless defined the livelihood basis and cultural setup of most dryland pastoral communities.

The centrality of climate in influencing several agricultural and natural resources production systems in Uganda has severally been discussed (e.g. Hepworth, 2010). Rainfall variability, flooding, droughts and rise in temperatures have been blamed for several losses in crop and livestock production. It is now generally discussed that climate change is a reality and no longer an issue of the past with debilitating impacts on maize, coffee and potential decrease in livestock grazing lands in the cattle

corridor (GoU, 2007; Wasige, 2009; Ekiyar *et al.*, 2010). However, there are no known studies that have attempted to quantify the effects of climate variability and change of forage availability and productivity in the Uganda's cattle corridor. This study seeks to bridge this gap. It will specifically seek to: (i) determine forage availability and factors influencing its productivity in the rangelands of Karamoja; (ii) determine the relationship between forage availability, composition and water points in Karamoja; (iii) establish the relationship between forage availability and livestock population dynamics in Karamoja; and (iv) project forage availability in Karamoja in the context of a changing climate.

Literature Summary

East Africa's climate is naturally dynamic with high temporal and spatial rainfall variability. This natural climate variability has had significant socio-economic impacts in Uganda, in particular through floods, droughts and changes in seasonal rainfall. Floods in 1961/62, 97/98 and in 2007 saw wide spread infrastructure damage, displacement and destruction of livelihood assets (Hepworth, 2010). In the recent past, heavy rains have caused havoc in the Elgon region leading to landslides that have killed over 400 people. Droughts have also had a considerable effect especially along the cattle corridor. The International Database indicates that about 4.11 million people have been affected by climate related disasters of different kinds since 1979 (Hepworth, 2010). This figure may actually be an underestimation given the recurrence of climate variability events in the last decade.

Temperatures in Uganda are expected to rise by 1.5°C in the next 20 years and by up to 4.3°C by the 2080s. This is a general country projection however that variability in increases is anticipated although this remains unclear due to limited local scale level downscaling. Further, changes in rainfall patterns, total annual rainfall amounts and rainfall intensity are expected to show declines but there is limited certainty-projection are local level scales has barely been conducted. The cattle corridor is expected to be hardest hit by these changes given the already precarious situation. Dealing with this uncertainty requires the use of early warning systems. Due to the importance of livestock in the cattle corridor, the livestock early warning systems have been piloted. Their use is however mainly limited to livestock markets monitoring; limited efforts have been put at monitoring natural resources that support livestock production such as forage resources as well as rangeland health.

Study Description

This study will be conducted in Karamoja sub-region. Karamoja covers a land area of 27, 200 square km and is located in North Eastern Uganda between 1°30'-4°N and 33°30'-35°E. It has seven administrative districts namely; Amudat, Napak, Kotido, Moroto, Abim, Kaabong and Nakapiripirit. This study adopts qualitative and quantitative research approach. Cross-sectional data obtained through a household survey using semi-structured questionnaires will be used to quantify the relationship between forage and livestock population dynamics. Remote sensing through satellite imagery analysis will be integrated in the quantification forage availability while biomass clipping will be utilised in determination of forage productivity. Statistical downscaling approach will be utilised in climate downscaling and modeling. In addition, focus group discussions, key informant interviews, transect walks will be utilised in participatory forage inventory, grazing decisions and forage resource management approaches.

Research Application

This study will make a contribution towards furthering the development of livestock early warning systems (LEWS) in Uganda. This will be instrumental designing appropriate interventions in livestock production. It will also be instrumental in sustainable management of natural resources that support livestock production as well as ensuring rangeland health monitoring in the sub-region.

Acknowledgement

We are grateful for the funding support from the Rockefeller Foundation through RUFORUM. This funding was instrumental in funding the commencement of Mr. Egeru's PhD study at the University of Nairobi.

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