



Climate Change, Pastoral Resources and Livestock in the Sahel

Peter Shapland, Lara Prihodko & Niall Hanan
South Dakota State University, Brookings South Dakota, USA

RB-11-2013

May 2013

Research Brief

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

Abstract

Currently, we have an inadequate understanding of how the interaction of climate change and agricultural expansion will impact pastoral and agro-pastoral communities and their production over the coming decades. Our research program is developing an integrated pastoral systems simulation model to study how climate and land use changes in West Africa will impact extensive livestock production systems and pastoral livelihoods through interacting impacts on grazing resources, water resources and transhumance corridors used for cattle migration. Our early work has concentrated on understanding how pastoral communities perceive and are responding to climate and land use changes, mapping annual transhumance patterns of sample herds to improve our understanding of livestock access to critical resources in space and time, and model-based evaluation of the interactions between climate, herder decision-making and the availability of grazing and water resources. This project aims to translate fundamental scientific research to help poor communities prepare for and adapt to climate and land use change and consequently reduce the vulnerability of pastoral communities in West Africa.

Background

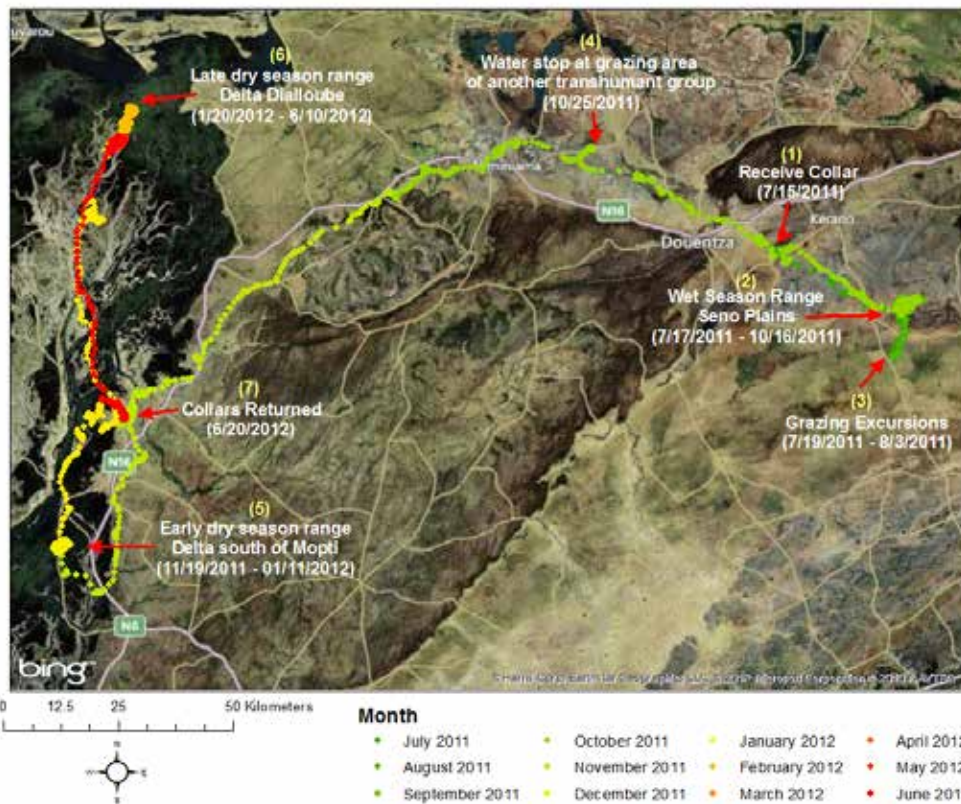
Climate Change, Pastoral Resources and Livestock in the Sahel is a Research for Development program that will leverage long-term ecological and pastoral systems research in West Africa to develop products of direct and applied value to local pastoral communities. We are an interdisciplinary team of Malian, Senegalese and US researchers, educators, students and NGOs working to develop a pastoral systems model (incorporating vegetation dynamics, livestock and ecophysiological sub-models and land use trends) that can be used to explore how climate and land use change will impact future pastoral resources in West Africa. Our extensive consultative process will allow pastoralist communities to guide model-based scenario development. Outreach activities will then 'translate' model-based results back to stakeholder communities in ways that help them prepare for and adapt to future climate and land use change. The intent is to increase preparedness and reduce vulnerability, and thereby enhance the long-term sustainability and welfare of pastoral communities in West Africa.

Our project partners in Mali include: the University of Bamako (UB), the Institut Polytechnique Rurale (IPR) and three community based Non-Governmental Organizations (NGOs) that focus their work on agropastoral systems and development: the Centre d'Etude pour la Promotion Agro-Pastorale (CEPAP) in Niore, the Association pour l'Développement Intégré dans la Savanne et le Sahel (ADISSah) in Diema and Recherche d'Initiatives et de Coopération pour un Développement Communautaire et Autonome (RICAD) in Sévaré. In Senegal, our project partners are Agronomes et Vétérinaires sans Frontières (AVSF). In the U.S. project partners are based at South Dakota State University (SDSU) in the Geographic Information Science Center of Excellence (GISsCE).



Pastoralist and his herd in Senegal. (Photo by Peter Shapland)





Left. Figure 1. The annual movements of a transhumance herd that travel between wet season grazing in the east and the Inland Delta of the Niger River in the dry season, monitored using a GPS collar recording cattle location hourly.



Equipping a cow with a GPS collar for transhumance movement tracking. (Photo by Balougo Telly)

“Our project aims to translate fundamental scientific research to help poor communities prepare for and adapt to climate and land use change and consequently reduce the vulnerability of pastoral communities in West Africa”

Methods and Early Results

GPS radio collars were distributed to six different transhumant groups by our NGO partners, two each in the Niore, Diema and Sevaré region of Mali, to evaluate how livestock access critical resources in space and time. We attached radio collars to six of the cows for one year to capture the entire seasonal movement of the transhumant group. The radio collar transmitted the position of the cow every half hour during the day and every hour at night. Figure 1 shows an example of the movements of a transhumant group from July 2011 to June 2012 in the Sévaré region. This particular herd spent late July 2011 through mid-October 2011 in their rainy season grazing area southeast of Douentza. Initially the transhumant group spent a few weeks making excursions of up to 9.5 Km from their primary grazing spot, but eventually settled into an orbital area of approximately 6.5 Km in diameter. At the end of October, they left the Douentza area and headed west towards the Inland Delta of the Niger River, following a route that curved with the main road that runs north towards Gao and south towards Bamako (the RN16). They crossed the Niger River south of Mopti and spent a few months in the area (late November 2011 to early January 2012) before heading north into the delta where they spent the rest of the dry season (late January 2012 to early June 2012).

Transhumance patterns in this region are oriented to the ebb and flow of water in the Inland Delta, which is in strong contrast to other areas of the Sahel, which are oriented to the seasonal patterns of rainfall and more mesic savannas to the south. We are currently analyzing the data from the collars to produce maps for the NGOs and their respective pastoral communities and we anticipate redeploying collars in Senegal and Mali.

In the Ferlo region of Senegal, AVSF and SDSU have led an effort to establish a baseline of transhumant pastoralists' perceptions of the impacts of climate and land-use change on their production system as well as an analysis of pastoralists' informational needs. The pastoralist ability to adapt to climate and land-use change is influenced by their current understanding of climate and land-use change, their capacity to adopt new practices, the size of their herds, mobility, diversification of their livelihoods and their access to social networks, institutional structures and markets. Our survey established a reference point for each of these six factors.

Working together, the SDSU and AVSF team interviewed 127 transhumant families. The primary climate-related changes the pastoralists had observed were irregular rainfall, increased desertification and loss of indigenous plants (Figure 2). In their opinion, these changes have led to degradation of pastures, fewer water points and diminished animal health (Figure 3). At the same time, expanding agriculture has led to decreased access to both pasture and water points (Figure 4). We also asked respondents to describe their current methods of adapting to the changes they have observed. Approximately half of those interviewed hadn't made any changes. Those that had made changes responded that they were buying more feed, vaccinating more of the herd, and migrating more, among other diverse adaptations.

The team also conducted a needs analysis among eight focus groups. During these focus groups, we asked the pastoralists to rank the barriers to improving their livelihood such as lack of good pasture, conflict, animal disease, market

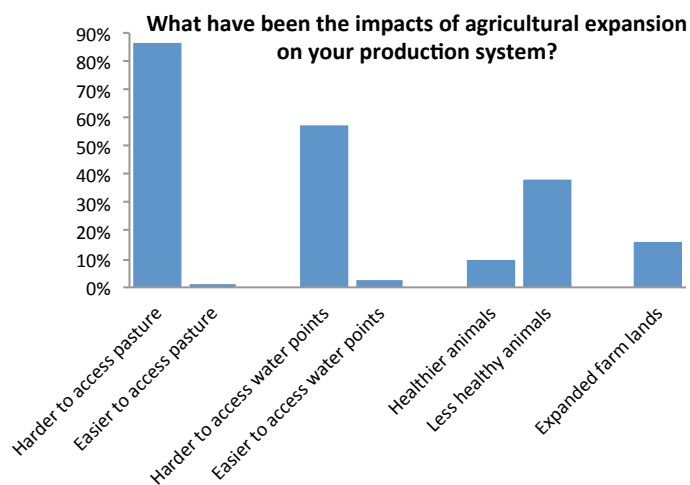


Figure 2. "Perceptions of climate change" surveys in the Ferlo Region, Senegal

access and shrinking corridors, and they described and prioritized their concrete problems within each of those themes. They also indicated the cause of problems and potential solutions. Data like these will help us adjust our research priorities and future development activities within a larger understanding of the problems pastoralists face. The pastoralists mentioned that lack of good pasture, scarce water points, animal disease, and conflict with agricultural activities were the primary barriers to livelihood improvement (Figure 4). Pastoralists are also most interested in diversifying their economic activities within the scope of their traditional livelihoods, in particular through involvement in the milk trade or commercialization of livestock. And lastly, to ensure that the modeling activities within the project respond to pastoralist needs, we asked respondents to evaluate their own predictive abilities in assessing key resource availability during transhumance. Our project team is continuing to interview more transhumant groups and we will be evaluating the survey responses as we move forward.

Future steps

The Climate Change, Pastoral Resources and Livestock project will be developing modeling capacity in Mali and Senegal that can be used to address fundamental and applied questions regarding the future productivity and sustainability of West African pastoral systems. Our broad research questions include:

1. How will climate change, including long-term increases in temperature, and spatially and temporally variable changes in precipitation, impact the quantity and quality of fodder available for domestic animals via changing vegetation dynamics in pastoralists' wet and dry season ranges, and the availability of surface water points that constrain the length and season of herd access in many parts of the Sahel?
2. How will land use and land cover change, particularly agricultural expansion in pastoral regions and encroachment on traditional transhumance corridors, impact the wet and dry season availability of, and access to, grazing lands, access to water points, and continued access to transhumance corridors for herd movement?
3. How will climate change, land use change and pastoral management interact in future decades to determine the productivity and sustainability of West African pastoral systems and communities? This 'systems level' question represents the core of the project and will be addressed using multiple climate and land use change scenarios, with model outputs adjusted to answer questions particular to specific communities.

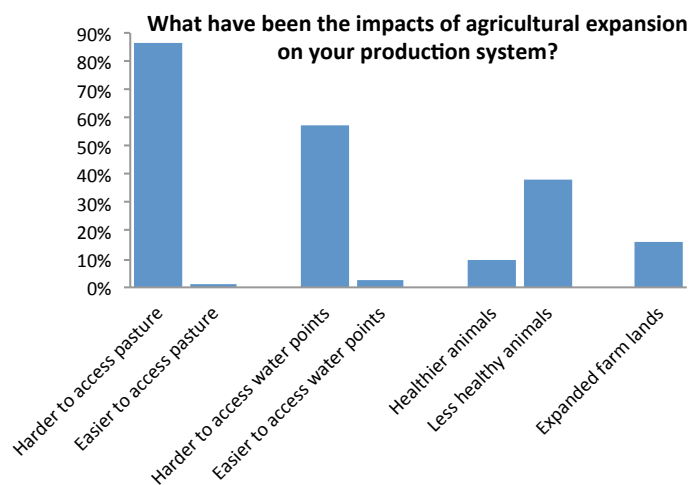
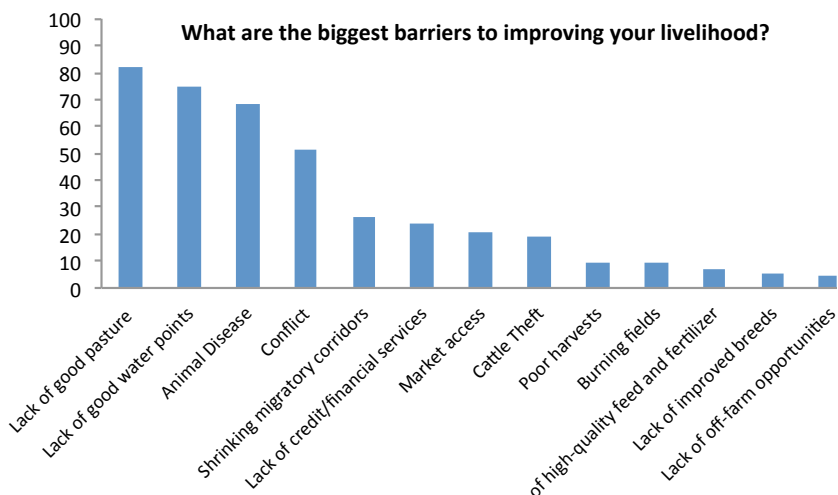


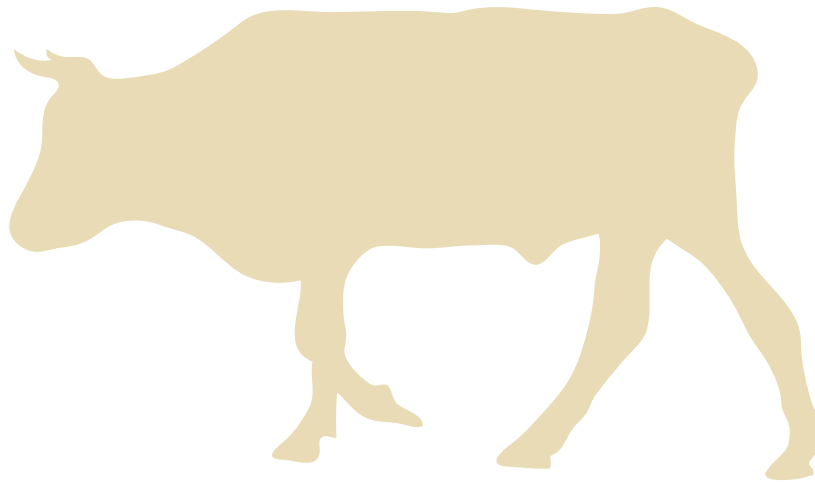
Figure 3. "Impacts of perceived climate change" in the Ferlo Region, Senegal

These research questions will be addressed through collaborative research among US and West African academic collaborators, capacity building with students and grass-roots pastoral NGOs and discussion with the pastoralist communities we are working with. The ultimate goal of the project is to consolidate the research, the development activities and the pastoralist perspectives into informational products that can serve as an additional reference as pastoralists consider and develop new strategies to adapt to their changing worlds. 🐄

“The ultimate goal of the project is to consolidate the research, the development activities and the pastoralist perspectives into informational products that can serve as an additional reference as pastoralists consider and develop new strategies to adapt to their changing worlds.”

Figure 4. "Perceptions of agricultural change" surveys in Senegal.





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.

This publication was made possible through support provided by the Bureau for Economic Growth, Agriculture, and Trade, U.S. Agency for International Development, under the terms of Grant No. EEM-A-00-10-00001. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development or the U.S. government.

