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March 2013

Feed the Future Innovation Lab

Progress Report: Our Impact Pathway



Collaborative
Research on Adapting
Livestock Systems to
Climate Change



*Opening a Path to
Possibilities...*

Editorial Content: Shana Gillette
Graphic Design: Nicole Gutierrez

Contact:
Shana Gillette, Deputy Director
Colorado State University
Campus Delivery 1644
Fort Collins, CO 80523-1644
Email: shana.gillette@colostate.edu
Web: lccrsp.org

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A Message from the Management Team

Dear Friends,

We are now almost three years into our collaborative research program and we are confident our activities in South Asia and Africa are making steady progress toward generating information and developing technologies that can help policymakers and livestock holders increase the resiliency of livestock systems in the face of changing climatic conditions.

In the next two years, we look forward to extending the impact of our current research and initiating exciting new research directions that increase understanding at the intersection of animal, human, and environmental health. We will be looking for new technologies that can more precisely measure connections between climatic conditions, nutrition, and food safety. We will also be exploring the use of innovative tools and practices for addressing gender and nutrition issues in small-scale production, especially at the household level.

Dick Bowen, Director
Shana Gillette, Deputy Director

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Our network of research partners includes national agricultural institutes such as the Nepal Agricultural Research Council.

Along our impact pathway, we generate interesting questions that help identify knowledge gaps and needs at local and regional levels. We integrate thinking across disciplines to design research approaches that are interdisciplinary and transnational in nature. Through degree and non-degree training, we activate individuals, households, communities, and governments to assess current practices and knowledge that lead toward the design and implementation of innovative solutions.

Our program's foundation is a set of reinforcing and integrated research activities that address the impacts of changing climatic conditions on livestock holders in S. Asia and Africa: increasing temperatures; increasing frequency and intensity of drought and heavy rains; lack of reliable water resources; and lack of market options to strengthen resilience in the face of socio-economic shocks.

This progress report marks the mid-point of our program evolution which started with the launch of *Feed the Future*. Since our inception, we have conducted evaluations to identify promising research trajectories that warrant funding. After reviewing results from pilot studies in South Asia, East Africa, and West Africa following the first year of our program, we identified projects that had the highest potential for impact in both the research and development arena and funded three-year projects in the second year of our program.

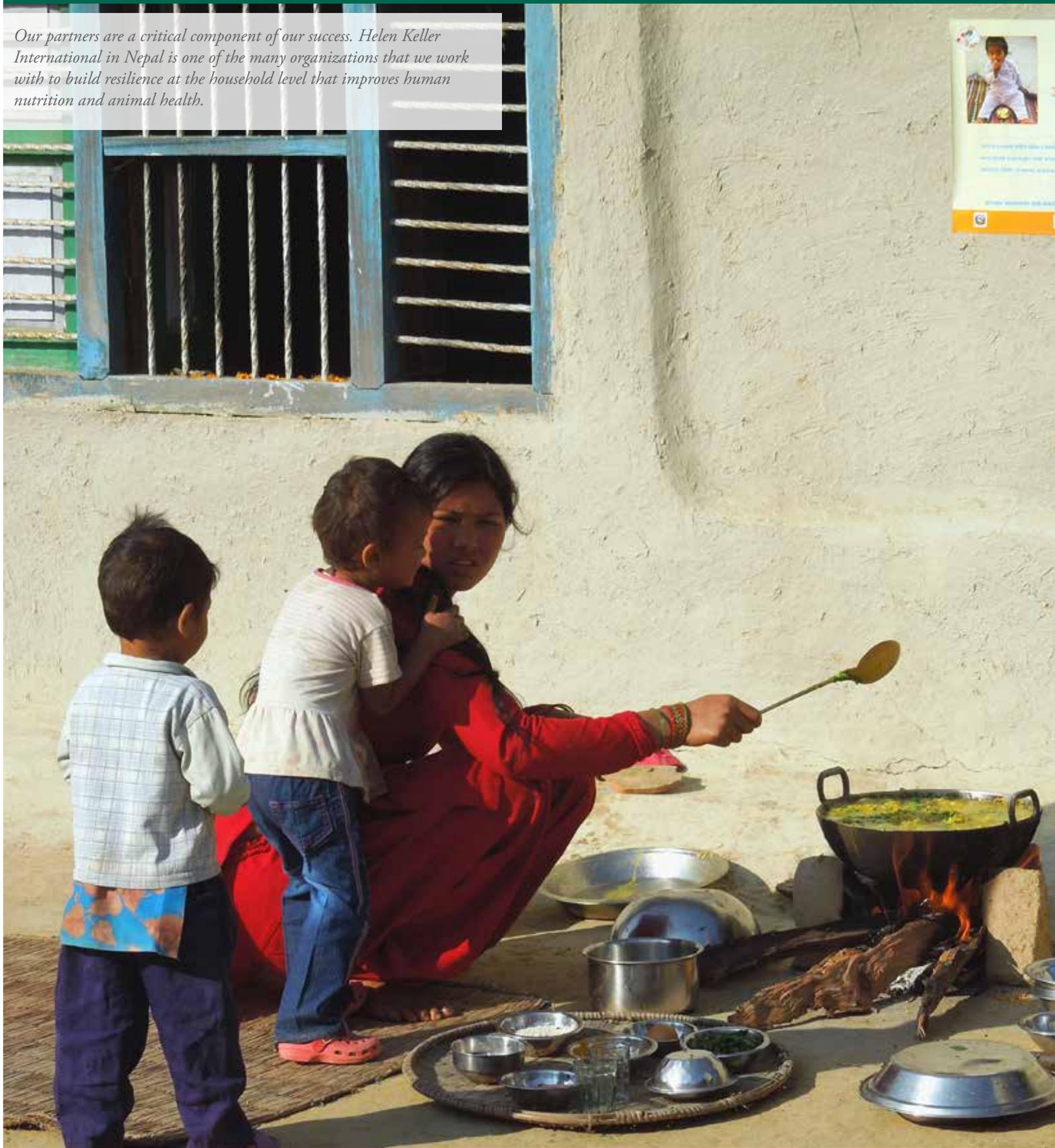
The overall impact of our research portfolio will be measured by how well we align our initial program objectives with the ongoing evolution of the USAID *Feed the Future* initiative. In order to ensure alignment with the initiative and our research and development goals, we have created an alignment plan to foster joint ownership in our research among our focus country partners, US universities, and USAID. The alignment plan, created at the mid-point of our program, is serving as a guide to inform the impact assessment of our individual research projects and overall program. Starting in 2013, we will undertake a series of activities to build capacity in evaluating our research projects for early results and longterm development impact. We are also instituting a transparent, online process for charting our progress over time.

Our Impact Pathway

Progress Report



Our partners are a critical component of our success. Helen Keller International in Nepal is one of the many organizations that we work with to build resilience at the household level that improves human nutrition and animal health.



South Asia: Nepal

Progress Report



Nepal



Key Accomplishments

- Completed climate assessment in Far-Western Nepal, initiated an assessment in the Gandaki River Basin
- Launched mini-grant program for early-career researchers (TIRI)
- Produced journal articles with Nepali co-authors, leveraged funding resources

South Asia is undergoing changing climatic conditions that are increasing temperatures in the lowlands, shifting the onset of the monsoon season, affecting the quality and quantity of forage production in the mid-hills, and increasing the speed of

glacier melt in higher elevations. These changing climatic conditions are expected to have an impact not only on the agro-ecosystems in Nepal, but on the agricultural systems downstream in India. The importance of Nepal as a headwater source for agricultural water makes climate assessments essential to understanding evolving agricultural needs in the next ten years.

For small-scale livestock holders, these changes are likely to impact decisions on the type of livestock they keep, when to buy and sell, and what forage and feed to use in the dry and rainy seasons. Our lab is using new statistical techniques to analyze climate data and produce results that will aid policymakers and livestock holders in devising resilient adaptive strategies. We are also funding several early-career researchers to examine the impact of these changing climatic conditions on disease spread.

South Asia: Nepal

Progress Report



Research Impact: Climate Assessment

Utah State University (USU) and the City University of New York (CUNY)-City College are leading the Lab's climate assessments for Nepal. USU has already completed a climate assessment that has helped inform decisions at the Ministry level regarding climate change impacts on agricultural production in Far-Western Nepal.

Research by CUNY is currently underway to complement the climate assessment in Far-Western Nepal with a climate assessment in the Gandaki River Basin (GRB). The Bi-lateral Mission in Nepal identified the climate assessment as high priority because it will not only provide information on a river basin that supports agriculture in the Terai region of Nepal, but also supplies water to the Middle Gangetic Plains.

Results from the Far-Western climate assessment indicated the likelihood of impending drought Nepal (Gillies and Wang, 2012). By analyzing precipitation data, paleo (tree-ring) data, and data from the NASA Grace twin satellites, Gillies and Wang observed a robust decline in winter rain since 1995 over western Nepal, a rapid decrease in ground water in recent years, and found the most recent drought to be unprecedented in severity. These findings have helped shape the direction of a more in-depth assessment which will be completed in 2015. Early results from that research have recently been reported (Gillies et al., 2013).

Initial results from a socio-ecological assessment in the same region has identified current adaptation strategies for herders and has helped build a framework for action by policymakers in Nepal (Chhetri, 2011). Arizona State University in collaboration with partners in Nepal is leading the research which will be completed in 2015. Michigan State University will be adding to this evidence base by examining climate impacts on water buffalo production.



Large ruminants are affected by increasing temperatures and changes in the quantity and quality of forage.



One adaptation strategy is to switch livestock type to small ruminants.

East Africa: Ethiopia & Kenya

Progress Report



Ethiopia



Key Accomplishments

- Identified market innovations
- Published briefs and other publications
- Launched mini-grant program for early career researchers (TIRI)



Kenya

In many areas of East Africa, livestock holders are facing increasing temperatures, longer periods of drought, and heavy rains. The increasing variability in precipitation is affecting river runoff, water availability and subsequently the natural recharge of groundwater and surface water. Although current science lacks sufficient resolution to inform large-scale planning of adaptation strategies across regions, it does indicate areas of climate sensitivity. In addition to the research that we are funding on livestock market behavior under changing climatic conditions, we have also funded several early-career researchers in Kenya and Ethiopia to investigate climate impacts on disease distribution and animal health.



East Africa: Ethiopia & Kenya

Progress Report



Research Impact: Value Chains

In Ethiopia, we are based in the Borana, a region known for its deep wells that have traditionally served as a reliable water source for people and animals during dry periods. However, as the intensity and frequency of droughts have increased, the water level in many wells has dropped precipitously. Our current research is actively dedicated to mitigating livestock loss by identifying “best-bet” strategies for herders (Coppock, 2013).

In a recent book chapter, *Pastoralism and Development in Africa: Dynamic Change at the Margins*, Peter Little of Emory University describes pastoralism as a constantly evolving livelihood system that is responsive to several dynamic forces such as international markets and mobile phone technology (Little, 2012). In research funded by our Lab, Dr. Little is collaborating with Ethiopian colleagues to provide a qualitative and quantitative assessment of market opportunities for small-scale livestock buyers and traders in an uncertain physical and commercial climate.



In areas impacted by climate change, response at the farm level can range from adjusting the number and type of livestock, to changing feed, altering health practices, modifying transhumance patterns, and diversifying livelihoods.

Above: Kenya livestock holders, photo credit: Dana Hoag

Left: Market discussions in Ethiopia, photo credit: Osman Hamden



East Africa: Tanzania

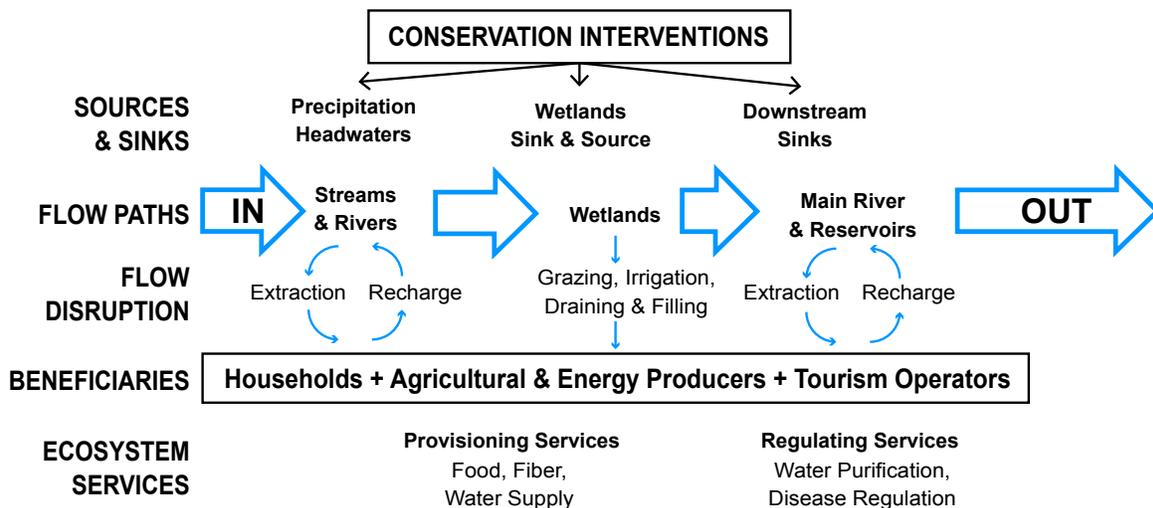
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Tanzania



In Tanzania, we support research that is focused on improving livelihoods in the Ruaha landscape where livestock production is an important source of income, wealth, and culture. University faculty and students from the U.S. and Tanzania are assessing the impact of disease and water scarcity on the health and livelihoods of pastoral communities.



Conceptual diagram of the Ruaha landscape integrated modeling framework.

East Africa: Tanzania

Progress Report



Key Accomplishments

- Conducted baseline survey
- Initiated mobile phone reporting
- Initiated school curriculum on climate

Research Impact: Health Outcomes

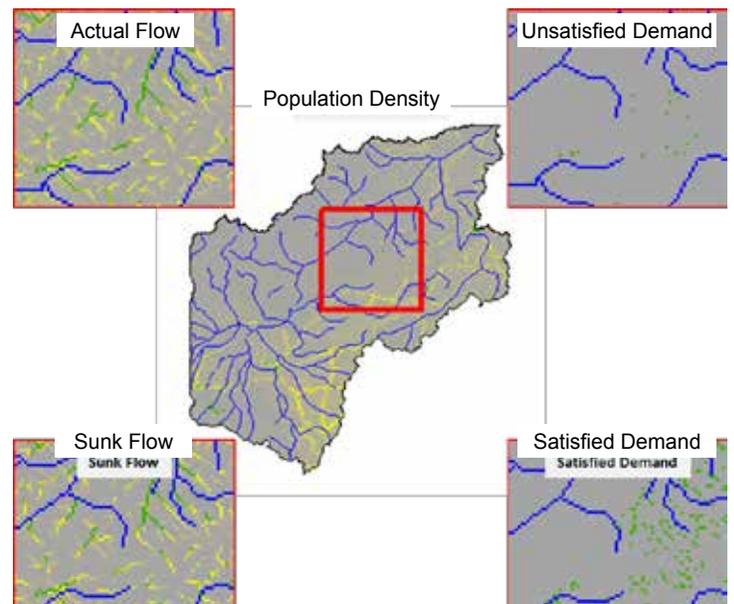
In pastoralist communities that depend on freshwater, climatic conditions are linked to changes in hydrological processes and threats to public health. Water scarcity during the dry season brings animals and people together more frequently to share water for agricultural and domestic use, thereby affecting health and food safety. Our research examines how water quality may impact health and what practices may be associated with a higher risk of disease in livestock and people. The ongoing research project is also building Tanzanian university capacity in the rapid analysis of diagnostic samples and the reliable dissemination of results.

This research project, HALI 2, led by UC Davis, is increasing the training and diagnostic capacity of Livestock Extension Officers (LEOs), creating educational opportunities for women and children, and collecting real-time data on animal health, human nutrition, and livelihoods. Researchers are using the data in their ecosystem services model to assess health outcomes of different water management decisions.

In our Innovation Lab, we continue to expand our research portfolio in Tanzania. We currently fund research on poultry education in schools in both Tanzania and Nepal. This research is focused on improving livelihoods through the integration of health and production knowledge in the daily lives of rural populations. Other organizations such as the Peace Corps are interested in adopting components of the poultry education project in their activities.



*HALI-2 Team member and Dr. Barnabas Kahwage.
Photo Credit: Asha Makweta*



Map of the Little Ruaha watershed with the regional population density is depicted in the center of the figure. The Actual Flow map (top left) depicts the paths of water flow between source and use locations. The Sunk Flow map (bottom left) depicts water lost to evapotranspiration and ground water infiltration. The Satisfied Demand map (bottom right) reveals locations where beneficiaries were able to access surface water supplies. The Unsatisfied Demand map (top right) identifies locations where water flow is inhibited such that it is not able to reach human beneficiaries. Enabling or restoring blocked flows may limit water shortages for these downstream beneficiaries. For each of the maps, the greener the pixel, the greater the quantity of actual surface water flow, sunk surface water flow, unsatisfied demand, or satisfied demand in that location.

West Africa: Senegal & Mali

Progress Report



Senegal & Mali



The economic activities in the Sudano-Sahelian region are diverse with non-agricultural activities gaining in importance. Land-use is not only determined by subsistence agriculture but heavily influenced by migration, trade, and institutional change. Climate is a direct driver of change in this area.

Decreases in livestock have been attributed to other causes such as theft, disease, and competition with crops. Livestock producers in West Africa appear to be moving toward less climate-dependent livelihoods and increasing the percentage of their income that is derived from non-agricultural sources.

Recent political events in Mali necessitated a redirection of Mali research activities to Senegal for the near future.



Surveying pastoralists priorities in Senegal's Ferlo region for a coupled pastoral systems model (incorporating vegetation dynamics, livestock and ecohydrological sub-models, and land-use trends) to explore how climate and land-use change will impact future pastoral resources in West Africa (Hanan, 2010). Photo Credit: Peter Shapland



Research Impact: Resource Management

Our current research in Senegal explores how changes in climatic conditions are affecting the mobility patterns of pastoralists. South Dakota State University originally designed the research activities for Mali; however, recent political events required a shift in research activities to Senegal. The new area of focus in Senegal is the Ferlo, a semi-arid pastoral zone in Northeast Senegal. The SDSU researchers, in collaboration with their Senegalese partners, are collecting survey data that will be used in a coupled pastoral systems model that will help policymakers and pastoralists explore the impacts that climate and land-use change will have on pastoral resources in the future.

Syracuse University is leading a complementary research project in Senegal that is examining the services and support that riverine resources in the Senegal River Valley provide for pastoralists along transhumance corridors. The researchers are using geo-referenced data to identify key corridor points that are supported by riverine resources. The study of riverine systems is important because it provides dry season grazing reserves for herders and sources of water. An initial map of a “transhumance shed” has already been generated (see Figure 1, McPeak and Turner, 2012).

The research collaborations with new partners in Senegal have helped strengthen the Lab’s regional efforts in capacity building. SDSU is strengthening regional capacity for GIS and remote sensing, while Syracuse is building capacity in the analysis of feed and forage quality. Early results from both research projects have already helped guide discussions about potential areas of conflict over limited resources along transhumance corridors. Future results promise to provide products of value to both policymakers and pastoralists.

Key Accomplishments

- Mali-based research shifted to Senegal
- Identified Senegal research priorities through a stakeholder workshop
- Conducted training for research partners in Senegal

Model of a Transhumance Shed

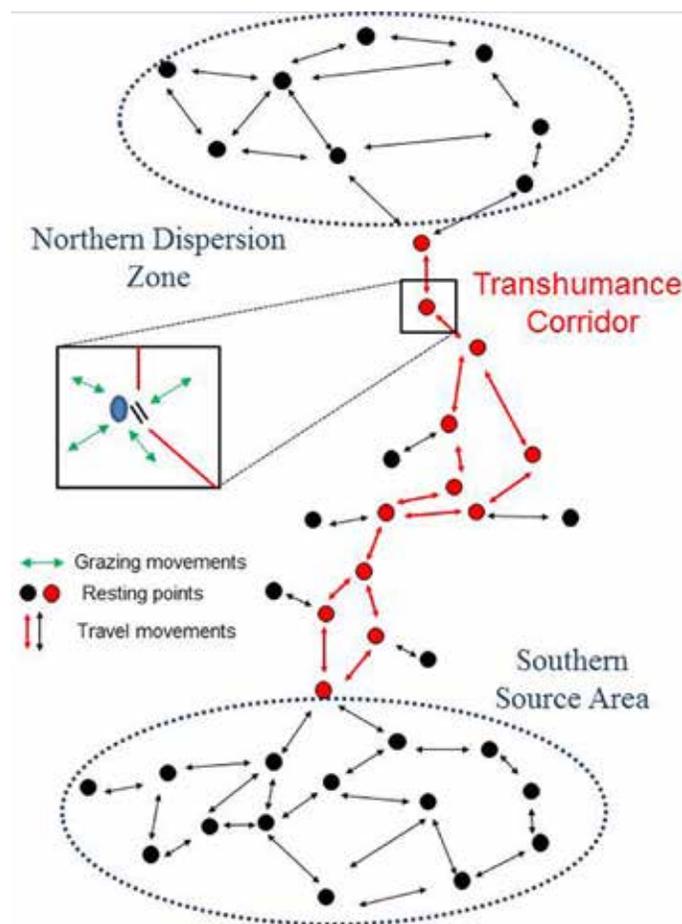


Figure 1. Within a transhumance shed, herds seasonally move between a group of home villages in the South to a Northern dispersion zone along specific corridors. The corridors consist of relatively well-defined resting points, represented by the red and black circles. Red arrows indicate points and movements that define the corridor, black indicates points and movements that feed into the corridor.

The Nexus of Gender & Nutrition

Authors: Alyson Young, Sarah Lindley McKune, Sandra Russo, Thérèse D'Auria Ryley



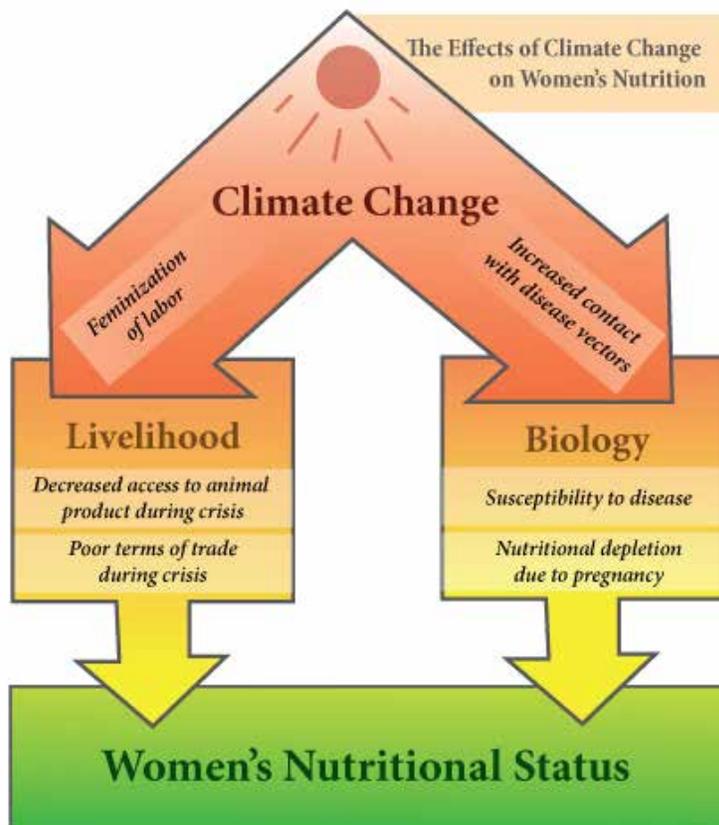
Introduction

The Nexus of Gender and Nutrition: A Literature Review addresses the interaction of climate change and nutrition within livestock holding communities. While this is a global issue, the review focuses on literature from West Africa and engages a gendered perspective. The literature indicates that certain adaptations to climate change, such as sedentarization, are potentially detrimental to the nutrition of people in livestock-holding communities, compounding the ways in which climate change directly affects health. While the authors focus on pastoralists, the review includes all those involved in livestock production in the definition of livestock holder in order to gain a more complete understanding of those affected by climate change. We look beyond calorie deficiency in our evaluation of nutritional outcomes to provide a complex illustration of the ways in which communities' nutrition is negatively affected.

Pastoralism: A Livelihood in Transition

Pastoralists have historically been the primary livestock holders in West Africa. Pastoralism is a finely tuned relationship that exists between humans, livestock, and fragile ecological systems, ecosystems often too poor to support agriculture and/or large populations. It is a livelihood whose practices, such as herding and associated mobility, are heavily embedded with cultural meaning and are significant determinants of identity. Pastoralists are severely impacted by the environmental degradation associated with climate change. Research on livestock holders in West Africa shows that rural communities not historically dependent upon livestock production have taken up the livelihood practice in recent decades, while others who have historically been nomadic herders have begun sedentarizing and initiating crop production. Women in pastoral communities are particularly vulnerable to the impacts of climate change, due to their lack of financial independence and their low social status.

Climate Change affects livelihood and health by decreasing access to resources and increasing susceptibility to disease.



Climate Change and Resilience

Despite the historically high adaptive capacity of pastoral communities to deal with environmental variability, such as drought, the increased frequency and severity of extreme events associated with climate change in West Africa are threatening pastoral resilience and leaving these communities highly vulnerable. Some livestock holders have adapted to climate change by choosing to keep different types of animals, altering patterns of mobility, and diversifying livelihood strategies. Often with the goal of maintaining livestock production as a primary livelihood activity, pastoral livelihood diversification also includes migrating to cities for wage labor and sedentarizing in

The Nexus of Gender and Nutrition

Authors: Alyson Young, Sarah Lindley McKune, Sandra Russo, Thérèse D'Auria Ryley



order to adopt agricultural activities. While some of these adaptive strategies serve to improve livelihood security, some leave pastoralists more vulnerable to future shocks. Adaptation to climate change is not gender neutral. Women are often left to perform the majority of livelihood tasks, in addition to caring for young children and the elderly, when men seek wage labor in urban areas. If and when households face hardship, women are the first to lose economic agency, either through the forced sale of personal assets or the forfeit of their engagement in markets to men. Ultimately, climate change serves to increase the vulnerability and marginalization of women in pastoral communities.

Pastoralist communities are at particular risk for undernutrition due to climate change. Climate change leads to low crop yields, which creates unfavorable terms of market trade for pastoralists, as they rely on trade of meat for grain. Low crop yields cause the trade value of grains to rise, rendering pastoralists unable to supply their families with enough calories. Undernutrition due to low crop yields and poor livestock health is exacerbated by the high caloric output of livelihood diversification practices, particularly among women.

In addition to the vulnerability of undernutrition women are also at high risk of disease and injury. Women tend to work long strenuous days, often while pregnant, increasing risk of injury. The work of women often places them in close proximity to disease vectors, such as mosquitoes, increasing their risk of poor health. The health of the community suffers as a result of women's undernutrition, as women serve as primary caregivers. High prevalence of undernutrition and disease puts women and children at risk, including increased risk for birth defects, as well as in utero disease transmission.

Implications for Future Research & Practice

Research indicates that climate change has a gendered impact on the communities it affects, and these impacts vary depending upon livelihood practices and the environment

in which they operated. Incorporating a gendered lens into the development of policies and legislation is an ongoing process and, consequently, must be continually reincorporated when new issues arise, such as the impacts of climate change on nutrition. Gender sensitive research and program implementation must take into consideration the valuable roles of both men and women in their communities. Understanding and responding to complex problems requires consideration, input, and cooperation of all members of a community, men and women alike.

Four-Fold Impact on Livestock Holders

- Low crop yields caused by the effects of climate change lead to calorie deficiency, causing undernutrition
- Uncharacteristic changes in temperature and weather cause disease outbreak, which, via infection, exacerbated undernutrition
- The ability to perform physically demanding coping tasks required for sustainability of the livelihood is compromised by disease and undernutrition
- Occurring simultaneous to disease outbreak, undernutrition causes increased susceptibility to disease

For the complete report and a full list of references, please see, "The Nexus of Gender and Nutrition: A Literature Review", available at: lcccrsp.org



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Carbon footprint

In 2012, we estimated that air travel, events, and research activities were the main GHG source for our program. We estimated GHG emissions from office operations to be less than one percent of our total emissions.

To mitigate our impact :

Air travel: We will offer offset options to participants in our events and research activities. We will manage our air travel to be as efficient as possible in the number of miles that we travel each year.

Events: We will commit to select environmentally-friendly hotel and restaurants for our events. We will print publications on demand and for special events. For general circulation, program publications will be available digitally and online. Event organizers will follow a protocol for reducing emissions at events.

We will offset any remaining emissions through small-scale agroforestry projects in Nepal and Tanzania that are near our research sites. This carbon offsetting of global emissions will occur biannually.



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