



Strengthening Tanzanian Livestock Health and Pastoral Livelihoods in a Changing Climate

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Adapting Livestock to Climate Change Collaborative Research Support Program

Abstract

East African pastoralists—whose livelihoods depend upon their livestock—are seriously threatened by climate change impacts on water, pasture, and disease dynamics. Disease can have devastating effects on livestock survival and marketability, threatening animal health and livelihoods. In Tanzania's biologically diverse and economically important Ruaha landscape, pastoralists relying on livestock for food, economic security, and cultural preservation have already faced water scarcity and disease losses in their herds. To address the adaptability of livestock systems to climate change-driven disease, we performed a capacity assessment of livestock health services available to rural pastoralists. Resource limitations, including long distances to access extension officers and medicines, and lack of transport and diagnostic supplies impair the delivery of livestock health services in this area. Spatial and tribal differences in reported diseases and approaches to improve livestock herd health, underscore the necessity for flexible, stakeholder-driven livestock health services. 

Pastoralist Access to Livestock Health Services: Implications For Climate Change-Driven Disease

Background

Pastoralists and livestock populations in semi-arid grassland regions are extremely vulnerable to climate change. Climate change-driven alterations in rainfall will likely have direct impacts on livestock productivity through water and pasture availability, and significant indirect impacts by altering disease dynamics and incidence. Response of disease vectors, animal hosts, and pathogens to climate change may increase outbreaks of diseases like Rift Valley fever, which can cause severe symptoms and even death in livestock and people. The risk of disease spillover among pastoralists, livestock, and wildlife also increases because of growing contact around dwindling water and pasture sources.

In the biologically diverse and economically important Ruaha region of Tanzania, livestock production is an important, yet threatened, source of income. The economy of the Ruaha region is closely tied to the Great Ruaha River, a critical freshwater resource for people, livestock, and wildlife. In recent decades, freshwater delivery has been limited by large-scale disruption from river diversion and intensive livestock grazing, driving human, livestock, and wildlife populations into closer contact around restricted resources. Tanzanian pastoralists in this area have already experienced the devastating impact of disease on livestock herd production and health and may be acutely sensitive to the impacts of climate change. The combination of expected severe weather patterns and intermittent, extensive periods of drought, as well as human influences on local resources, are likely to increase disease impacts on already burdened livestock populations in the region.



HALI research assistant Asha Makweta interviews a pastoralist. (Photo by Ian Gardner)

Adapting Livestock Systems to Climate Change Collaborative Research Support Program

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We report the results of a livestock health services capacity assessment conducted with local stakeholders at different levels: regional and district government veterinarians, village livestock extension officers (LEOs), and pastoralist households near Ruaha National Park. We designed the capacity assessment to identify livestock health service needs of the pastoralists and differences in perceived health care priorities among key stakeholders. This locally relevant baseline information will help to address important gaps in livestock health services, thereby increasing resilience to climate change-driven disease.

Methods

In 2011, three district and regional level government veterinarians, eight LEOs, and 31 pastoralist households were interviewed about access to livestock health services in rural areas of the Iringa region in Tanzania. Pastoralist households were located in Pawaga and Idodi, two contiguous divisions with varying environmental conditions—from semiarid in the south (Idodi) to arid in the north (Pawaga).

Household surveys included questions about the livestock holdings of each household, availability of water and pasture resources, availability of animal health resources (access to medicines, cattle dips, and livestock extension officers), and incidence and management of disease in livestock herds. District and regional veterinarians, LEOs, and pastoralists were asked to rank diseases of concern and the actions that they believe would most improve the health and long-term viability of livestock under changing environmental conditions.



A Maasai pastoralist prepares treatment for his cattle. (Photo by Liz VanWormer)

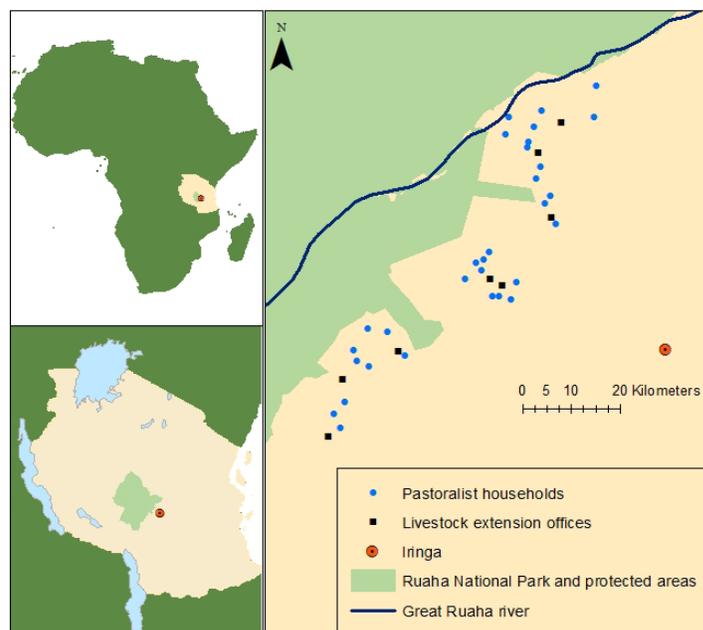
Preliminary Findings

Livestock holdings, disease, and health management strategies

Three ethnic groups were represented in the sample of 31 pastoralist households—Barabaig (7), Maasai (14), and Sukuma (10). The predominant species of livestock raised by interviewed pastoralists were cattle, goats, and sheep.

Pastoralists reported very different disease burdens in their herds, ranging from less than one percent of their animals affected to nearly

one third. Many respondents (15 of 31) believed that livestock illness was attributable to weather or the environment, nine named insects as responsible, and nine thought that disease came from other livestock. The most prevalent health problems reported for livestock were respiratory and neurologic diseases, both of which affected livestock in almost 40 percent of households.



Map of the study area within Africa (upper left), Tanzania (lower left), and Iringa region (right). Pastoralists households and livestock extension offices border Ruaha national park and surrounding community-based wildlife management protected areas. District and regional veterinary offices are located in Iringa.

Pastoralists used multiple approaches to prevent and treat disease. Restricting animal movement and interaction was a common strategy to reduce disease transmission. Most households (25 of 31) did not allow sick animals to graze with the rest of the herd. Nine households additionally removed sick animals from the herd, housing them separately outdoors or inside pastoralist homes. All households reported treating their sick animals independently, and eighteen respondents also sought advice from LEOs at times when they were not familiar with the disease or had many sick animals. Over 90 percent of households purchased commercially available drugs to treat their animals, and seven households complemented the drugs with traditional medicines.

Challenges in delivering livestock health services to pastoralists

The accessibility of LEOs and commercial medicines presented a challenge to the delivery of health care services to pastoralists. Pastoralists primarily travel by foot or bus, creating opportunity costs to obtaining health care. For instance, pastoralists traveled an average of three hours one-way to reach a LEO, and nearly five hours to reach a vendor selling medicine for their animals. Moreover, six pastoralist households reported that they did not use LEO services because the LEOs would not or could not come to their households. All LEOs reported that limited government funds for transportation constrained their ability to reach pastoralist households.

Pastoralists	LEOS	District/Regional Veterinarians ¹
1. Respiratory diseases 2. Neurologic disease (circling in goats) 3. Lameness	1. Sleeping sickness (Trypanosomiasis) 2. Respiratory diseases 3. Neurologic disease (circling in goats) 4. Rift Valley Fever 5. Tick-borne diseases	Bovine tuberculosis Brucellosis Foot-and-Mouth disease Neurologic disease (circling in goats) Respiratory diseases Rift Valley Fever Worm infestations

Table 1: Diseases of concern to pastoralists, Livestock Extension Officers (LEOs), and district/regional veterinarians (¹vets did not rank disease concerns)

Diseases of concern at district or regional, village, and pastoralist household levels

Pastoralists, LEOs, and district veterinarians had different views about the most important diseases threatening livestock in the region. See Table 1. In addition to livestock diseases, veterinarians and LEOs stressed the importance of rabies as a concern in domestic dogs, but rabies wasn't identified as important by pastoralists. However, individuals surveyed at all levels expressed concern about deaths due to Newcastle disease in chickens.

Spatial differences existed in pastoralists' diseases of concern. Neurologic disease (circling in goats) was more commonly described as a major concern in Pawaga, the northern part of the study area where 77 percent of households identified it as a threat to their herds. Only 12 percent of households in the southern region, Idodi, were concerned about the impact of circling disease. More than two-thirds of the pastoralists listing respiratory issues as an important disease lived in Idodi, though the difference was not statistically significant. Additionally, 80 percent of the households concerned about Newcastle disease were in Pawaga. The spatial differences in the concerns of pastoralists were also reflected in the responses of the LEOs, who identified circling disease as a concern in Pawaga.



The health of pastoralists and their livestock are closely connected. (Photo by Asha Makweta)

District, village, and household perspectives on actions to improve livestock health

The district veterinarian, LEOs, and pastoralists ranked actions to improve the health of their livestock. Veterinarian and LEO options were self-identified, and the five options provided to pastoralists (respondents could provide their own options, though only one did) were more cattle dips, livestock health research, additional education

for LEOs, education for pastoralists, and increased availability of medicines in the villages. The district veterinarian ranked education for pastoralists and LEOs as equally important priorities, followed by better transportation and diagnostic tests. Continuing education and access to diagnostic tests were the most important actions for LEOs, closely followed by better transportation to reach pastoralist households.

The pastoralist rankings of actions to improve livestock health differed by ethnic group (tribe). The preferences of the Maasai and Sukuma were very similar, with both tribes ranking increased availability of medicines in the villages first, pastoralist education second, and LEO education third. The Maasai ranked research fourth and cattle dips fifth; for the Sukuma the lowest two choices were reversed. The Barabaig's preferences for some options differed significantly. They ranked the options, from best to worst, as cattle dips, medicines in the villages, research, LEO education, and pastoralist education.

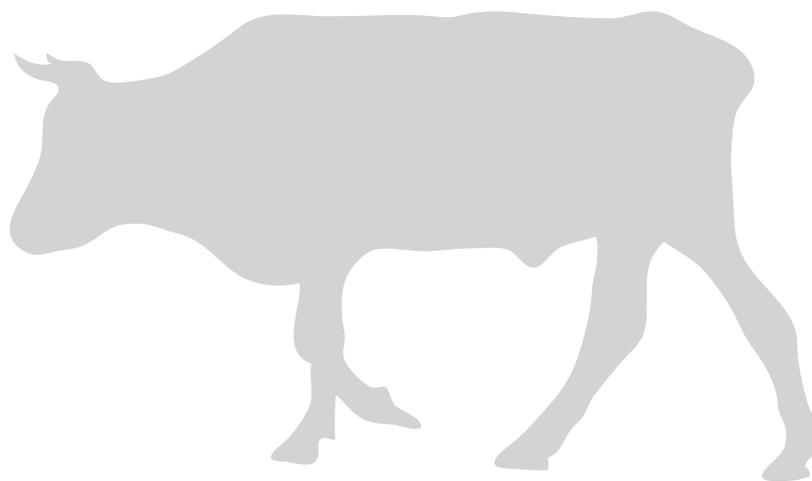
Practical Implications

Pastoralists, LEOs, and regional and district veterinarians identified several challenges limiting access to livestock health services. Resource limitations including lack of transportation and diagnostic supplies restricted the ability of LEOs to visit pastoralist households and diagnose sick animals. The distance from households to LEO offices and livestock pharmacies also impacted pastoralist access to extension services and treatment for their animals. In the case of an outbreak of climate change-driven disease, these distances and diagnostic obstacles could prevent disease surveillance and reporting necessary to protect animal and human health. Limited access to extension officers and livestock treatment options may also increase the potential for the spread of additional zoonotic pathogens from infected cattle, sheep, and goats to their pastoralist keepers.

While some key diseases were reported as important by all groups of stakeholders, the differences in priority diseases identified at regional or district, village, and household levels emphasize the need for increased communication between policy makers and pastoralists. Small-scale spatial differences in diseases threatening pastoralist livestock herds also underscore the importance of adapting livestock health services to local populations. These findings indicate that rural livestock health systems need to be able to adapt to different needs, even in relatively small, contiguous areas in order to protect livestock health under changing environmental conditions. Additionally, tribal differences in prioritizing approaches to make livestock more resilient to climate change-driven disease suggest that there are no available "blanket" policies that pastoralists believe would improve livestock health. In order to maximize pastoralists' trust in and access to veterinary and extension services, local priorities must drive investment in the livestock health system, requiring a flexible, stakeholder-led agenda. 

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Strengthening Tanzanian Livestock Health and Pastoral Livelihoods in a Changing Climate (HALI2)

Principal Investigator: Ian Gardner, University of California, Davis

The HALI2 project was developed to (1) Assess livestock health services and pathogen diagnosis and response capacity and (2) Create a framework to model adaptation of pastoralist communities to climate change.

Livestock production is extremely vulnerable to climate change in semi-arid grasslands, due to changing water and pasture resources and altered disease dynamics. Disease can have devastating effects on livestock survival and marketability, threatening animal health and livelihoods. In the biologically diverse and economically important Ruaha region of Tanzania, livestock production is an important, yet threatened, source of income, as communities are dependent on the natural resource base and livestock producers already face water scarcity and disease losses. To address the adaptability of livestock systems to climate change, we performed a capacity assessment of livestock health services; gathered and spatially annotated epidemiologic, economic, geographic, hydrologic, and meteorologic data; and established an on-going multidisciplinary team to model the effects of climate change on livestock health and human livelihoods in the Ruaha ecosystem with the long-term goal of collaboratively developing culturally appropriate and agriculturally sustainable interventions in response to climate variability. Integrated models of economic, epidemiologic, and environmental parameters will also help regional planning and decision-makers distribute scarce resources to address the most mitigable effects of climate change. This research leverages infrastructure and collaborations with local scientists and stakeholders established through previous phases of the Health for Animals and Livelihood Improvement (HALI) project, as well as agriculture and modeling resources from the University of Vermont, Colorado State University, Sokoine University of Agriculture (Tanzania), and the University of California at Davis. The proposed work will build collaborations among African and U.S. researchers, develop institutional and local capacity for health services and inter-disciplinary modeling, and engage the pastoralist communities that will be most affected by climate change.



The Adapting Livestock Systems to Climate Change Collaborative Research Support Program 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.

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