GLOBAL LIVESTOCK CRSP

Innovative Approaches to Evaluate Household Health and Livelihoods in Pastoral and Agropastoral Communities

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The emergence and spread of infectious diseases at the interface of humans, livestock, and wildlife are increasingly recognized as critical issues by health specialists, disease ecologists, conservation biologists, wildlife managers, and protected area managers throughout the world. Addressing the causes and consequences of disease requires investigation of links between various biological, environmental, agricultural and socioeconomic factors that cross disciplines, including at the least epidemiology, veterinary sciences, environmental science, public health, and economics. The Health for Animals and Livelihood Improvement (HALI) project has been designed to investigate these complex issues in the Ruaha landscape of Tanzania. The project uses an integrated approach to understand the drivers of disease transmission across the landscape and to generate preventive measures and interventions. This research brief provides an overview of the methods used to investigate health and livelihood strategies in pastoral and agropastoral communities near Ruaha National Park. Methods include household surveys and diaries, focus groups, choice modeling, and village economy models. Resulting analysis will estimate the impact of zoonotic diseases and water scarcity on household health and livelihoods across ethnic, economic, and gender groups, and make recommendations to reduce risk of diseases, better manage scarce water resources, and conserve wildlife in the Ruaha Landscape.

Background

Protected areas throughout the world are key for conserving biodiversity and provide a host of other services including watershed protection, carbon sequestration and regulation of vectors that transmit disease. Many protected areas, however, especially in developing countries, are experiencing increasing pressure due to population growth, expansion of cultivation, land degradation and widespread poverty limiting their capacities to perform these functions. As a result, people and wild and domestic animals are coming into close proximity, which can increase risks of predation and disease transmission that can compromise human, livestock and wildlife health. In the arid and semi-arid dry lands of East Africa, where the predominant production and livelihood system is agropastoralism, competition for scarce grazing and water resources is increasing, and the potential for interspecies disease vectors is growing as pastoralists move into new areas and/or live in the vicinity of protected areas.

The emergence and spread of infectious diseases at the interface of humans, livestock, and wildlife are increasingly recognized as critical issues by health specialists, disease ecologists, conservation biologists, wildlife managers, and protected area managers (e.g. Kock, 2004; Patz et al., 2004). Addressing these complex issues requires an integrated and transdisciplinary approach to detect problems and generate long-term solutions. Collecting information on these interface issues presents many challenges, especially in rural communities in developing countries where literacy and record-keeping are limited. The nomadic life of pastoralists is particularly challenging. For these reasons innovative approaches are needed.

The Health for Animals and Livelihood Improvement (HALI) project uses an integrated approach to understand the social, economic and ecological drivers of disease transmission in the landscape and to generate preventive measures and solutions. This research brief provides an overview of methods and multiple approaches used to capture the complexity of health and livelihood systems in the pastoral and agropastoral communities around Ruaha National Park.

Approach

The Ruaha landscape of southern Tanzania provides an ideal case study to investigate the interface of human, livestock, and wildlife health and the impact of zoonotic disease on economic livelihoods. Communities bordering the Ruaha National Park include traditional pastoralists and agropastoralists practicing subsistence living and traditional husbandry practices. The environment is characterized by unpredictable and variable rainfall resulting in prolonged periods of drought.

As human and livestock populations have grown with subsequent demands for agriculture and grazing lands, there has been increasing pressure on water resources for livestock grazing and irrigation of rice and other crops. Wetlands that previously provided year-round flow to the Great Ruaha River have been particularly impacted. The river stopped running year-round in 1993 and has dried up each year since. As a consequence, people, livestock and wildlife are forced into small isolated areas where water is still available during the dry season, increasing the risk for disease emergence and transmission between animal species (Clifford et al., 2008).

There is growing evidence that human-induced land use changes drive a range of infectious disease outbreaks and modify the transmission of endemic infections (e.g., Patz et al., 2004). Previous research in the East Africa has demonstrated that bovine tuberculosis (BTB) is a disease of particular importance to the health of water buffalo in Uganda (Woodford, 1982) and baboons in the Masai Mara of Kenya (Tarara et al., 1985). In Tanzania, a recent study by Cleaveland et al. (2005) confirmed the presence of tuberculosis (BTB) in multiple wildlife species in Tarangire and the Serengeti. However, little is known about the effects of water limitation on disease transmission, herd productivity and agricultural productivity in the Ruaha landscape or similar semi-arid regions; nor has the applicability of these effects more generally to wildlife conservation efforts, veterinary public health, and poverty reduction strategies been widely considered.

The socioeconomic research within the larger HALI project employed a combination of qualitative and quantitative research approaches to assess the impacts of zoonotic diseases and water scarcity on health and economic livelihoods of pastoral and agropastoral communities in the Ruaha ecosystem.

Overview of research methods

Table 1 highlights the mix of survey instruments utilized, including a long survey and paired sample short surveys between wet and dry seasons, as well as village economic sector inventories and household diaries. The resulting socioeconomic profile includes information on household production and consumption, family and animal health, husbandry practices, demographic characteristics, and water use behavior.

Household Surveys. A household survey was designed and administered to 159 households over a one-year time period. A sub-sample of 30 households participated in a repeated short survey to evaluate seasonal variations of livelihood strategies, health, income, expenditures, and changes in capital assets (livestock, land and crops). The questionnaire was aimed at estimating the livestock population and assessing the dynamic of stock variation throughout the year, the health of livestock, source of illness and the costs related to livestock health. In addition, information related to water and sanitation, household structure, labor and health, agriculture and other income generating activities was collected.

Results from both the long survey and the wet-dry season paired survey are currently being analyzed and will be summarized thematically in future HALI research briefs, including a brief detailing the research results on issues surrounding gender roles and participation.

Focus Group Research and Choice Modeling. Qualitative methods including semi-structured interviews and focus group discussions were used along with the survey data described in the previous section to inform a workshop and choice modeling exercise held in August 2008. Initial interviews were conducted with village leaders followed by a series of focus group discussions with the aim of identifying the most critical issues for their communities by economic sector. The focus group meetings were organized at both village and district levels.

Discussions were focused on identifying the three most critical issues in each economic sector, and issues were ranked by economic sector. In addition, participants in the focus group meetings were asked to identify

Table 1. Summary of quantitative data collection approaches

Type	Number	Objectives
Long household surveys	159	To obtain a socioeconomic profile of household production and consumption, measure attitudes towards diseases and diseases management, and assess household health and economic livelihood.
Short repeated household surveys	30	To assess seasonal variations of household production and consumption, health, and livestock population.
Village government economy inventory	20	To identify different economic activities existing in each village, number of people involve in each sector and the contribution of different actors to the village economy.
Household diaries	18	To quantify in monetary terms all income and expenditures at the household level and to better understand daily household and livestock fluctuations.

other economic activities or livelihood strategies that exist in the villages. Key findings are summarized in Table 2. The results of focus group discussions were used to develop and design a choice modeling exercise based on a conjoint analysis survey.

Table 2. Summary of most important issues by economic sector identified by focus group meetings at local and district levels.

Village level	District level	Overall
Agriculture		
Insufficient and poor irrigation system	Inaccessibility to the market	Insufficient and poor irrigation system
	Lack of skills	
	Poor irrigation system	
Education		
Insufficient infrastructure for teachers and classrooms	Insufficient number of teachers	Insufficient infrastructure for teachers and classrooms
	Poor infrastructures	
	Lack of awareness of the importance of education	
Health		
Lack of health care facilities	Limited number of medical staff	Lack of health care facilities
No access to clean and safe drinking water	Lack of health care facilities	
Limited number of medical staff	Poor sanitation	
Poor sanitation		
Livestock		
Lack of access/insufficient watering points	Lack of education in current husbandry practices	Lack of access/ insufficient watering points
Lack of dipping areas	Lack of access/insufficient watering points	

Conjoint Analysis. Conjoint techniques are well suited for soliciting and analyzing the preferences of stakeholders in environmental decisions that frequently involve tradeoffs between costs and benefits which are not efficiently represented in market transactions. A conjoint survey was developed with five attributes – infrastructure investment in water, health and education, tourism, farmer cooperatives, and extension services – with high and low levels of investment described for each. Two participants – the village executive officer and one other stakeholder – from each of the 21 villages were invited to participate in an all-day workshop. Ultimately, 38 of the 42 invitees attended the workshop; 26% of attendees were women. By ranking the discrete bundles of attributes, the importance values of each can be determined and compared to stakeholder position, gender, income level, village, etc. Asking respondents to make choices between alternatives mimics the real choices that managers must make, and provided stakeholders with a starting point for discussing complex tradeoffs and preferences in a workshop setting. Results from the conjoint analysis are currently being analyzed by the HALI team.

Village Economy Models. The direct impact of water management and diseases on livelihoods of pastoral and agropastoral communities can be studied quantitatively with household survey data and qualitatively with interviews with key informants. The indirect (or multiplier effects), however, are at least as important as the direct impact. For example, impacts of water scarcity on pastoralist livelihoods will also impact other households and village or regional industries that supply inputs to or are dependent on livestock production systems. Changes in income of pastoralists will also impact spending on household goods and services, further impacting the village economy. Both the direct and indirect economic impacts of water scarcity and disease emergence can be assessed using a social accounting matrix approach (SAM). Social accounting is an extension of input-output analysis, an analytical tool that models the interrelationship among different sectors of an economy. The SAM model shows the flow of income and expenditure among household production activities.

To aid in the construction of the village SAMs, 18 household diaries were used in a small sample of pastoralist and agropastoralists from different wealth categories: three relatively poor households and three relatively wealthy households from each of the three ethic groups were surveyed. A representative of the family or enumerator was selected and trained to record the information related to daily household expenditures, household earnings, household consumption, household health and livestock changes on a daily basis for four weeks. In addition, household enumerators made an inventory of all household supplies at the start of the surveys.

The SAM is based on the assumption that production activities are endogenous and demand-driven. Direct impacts introduced into the village economy produce changes in the flows of resources among sectors within

the village. The magnitude of these impacts (multipliers) depends upon the strength of the linkages between the sectors. In order to investigate the effect of some exogenous shocks and policies on village production, income, capital and labor allocation, a few scenarios will be investigated including: increasing demand for village output, investment in non-agricultural sectors, irrigation and water use efficiency improvements, general water scarcity, and costs of health care for both livestock and humans.

Practical Implications

The analysis of collected data will help to estimate the impact of zoonotic diseases and water scarcity on health and economic livelihoods across different ethnic groups, socioeconomic levels, distance to water sources, and degrees of wildlife interaction. The HALI team will combine survey, workshop, and model results to make recommendations for designing policies and strategies to reduce risk of diseases and address water issues in the Ruaha landscape.

While this research brief was primarily meant to summarize the socioeconomic methods used in HALI, findings from this research will be used by development agencies, non-governmental organizations, Tanzania National Parks, and village governance to develop strategies that improve the health and livelihoods of local communities. Information collected on perceptions and attitudes of local communities will also be used by veterinary, human health and agriculture extension officers as well as conservation outreach officers to develop extension programs that will educate people to minimize the risks of disease transmission between wildlife, livestock and local population and reduce conflicts between park and local communities.

Further Reading

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The Health for Animals and Livelihood Improvement (HALI) project was established in 2006 and is a stakeholder-driven research and capacity-building program to assess the effects of zoonotic disease and water management on animal health, biodiversity, and livelihoods in the Ruaha ecosystem, Tanzania. The project is led by Dr. Jonna Mazet, University of California, Davis. Email: jkmazet@ucdavis.edu.

The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East and West Africa, Central Asia and Latin America.

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