SUCCESS STORY

MANAGING RISK IN UNPREDICTABLE ENVIRONMENTS

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Cognizant of the environmental impacts of livestock production, the U.S. Agency for International development (USAID) funds an applied research program titled the "Global Livestock Collaborative Research Support Project" (GL-CRSP). This multidisciplinary program focuses on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk management in a changing environment. Active in East Africa, Central Asia and Latin America, its projects involve researchers from over 100 organizations and institutions in the US and developing countries.

Strategic objectives of the GL-CRSP include:

- strengthening the ability of institutions in developing countries to identify problems in livestock production and develop appropriate solutions;
- increasing employment and incomes among livestock producers and associated value-adding agribusinesses;
- improving livestock production while monitoring the effects of production on the environment and exploring the integration of production systems with the rational use of natural resources, such as wildlife;
- enhancing the nutritional status of targeted populations through increased availability and use of animal source products;
- providing support to decision-makers in developing policies that will promote livestock production, marketing, and processing of animal products; human nutrition and child physical and cognitive development; and natural resource conservation and management; and
- identifying, studying, and strengthening communication systems (including but not limited to extension) among livestock producers, businesses, researchers, and consumers.

GL-CRSP activities address one of three themes: the role of animal source foods in human nutrition, the role of livestock in economic growth, and the impact of livestock production on the environment. This article summarizes those ongoing activities that focus on the environment. Research is conducted in multiple countries of three geographic regions, namely Latin American watersheds, East African rangelands, and Central Asian pastures.

Community Planning for Sustainable Livestock-based Forested Ecosystems in Latin America (Project PLAN) fosters local farm community planning for sustainable land use within the mountainous watersheds of Bolivia, Ecuador, and Mexico. The small resource-poor farms within these forested watersheds are comprised of cattle, a diversity of minor livestock, crops, pastures, orchards, and gardens. Research focuses on the impact of increasing human population on the conversion of forest and the management of integrated livestock systems that protect and use the biodiversity of these ecosystems. The importance of water emanating from the mountain forest is central to the project, which is organized at the watershed level. The project uses a strong community-based involvement to address how to develop productive, profitable and environmentally sustainable food systems in marginal environments for livestock production.

Livestock-raising is a central component of the livelihood strategies of the smallscale farm households that characterize the mountain forest agro-ecosystems. Livestock production, along with the other activities that comprise the rural household economic strategy, represents an expression of their logic of diversification as a strategy to deal with the risk inherent in the variability of these mountain environments. The production of livestock of different sizes, life cycles, and food habits conforms to the criterion of efficiency and economics of the farm household, taking advantage of the ecological niches present within the household productive territory, and as a means to control productive spaces far from the homestead itself.

KEY ACHIEVEMENTS:
Where the rural poor live in juxtaposition to environments of rich biodiversity, the GL-CRSP is developing community capacity that provides the small farmers with the social and organizational tools to create and implement new strategies to increase food production, and diversify and increase income. Greater community capacity, focused on women's roles, will result in watershed management plans for poverty alleviation, biodiversity conservation and improved water quality in these fragile environments in the next three years.

Controlled access to the forest resources by livestock is difficult and impractical; forest forage is generally of low quality and both forest and pasture forage are highly variable in time and space. This does not, however, mean that this forage resource is transformed into an "open access" resource, where the inability to control access to the resource leads ultimately to its degradation. On the contrary, these local farmers have worked out local "institutional" arrangements over the collective use of private property as a means of meeting each other's needs.

Pastoral Risk Management Project (PARIMA)
The pastoral areas in arid and semi-arid East Africa are characterized by frequent drought, conflict, poverty and food insecurity. Increased human and livestock populations, intensified competition for forage and water, environmental degradation and lack of economic development have contributed to heightened instability in the pastoral zone. This project operates in a 124,000 km2 area of largely semi-arid and arid land extending form Hageremariam in southern Ethiopia to Isiolo and Baringo in north-central Kenya.

Pastoralists in East Africa often face the possibility that there will not be enough forage to support their animals due to poor rainfall conditions, thus sustaining high livestock mortality during crisis periods when animals are not removed through sales or migration from areas with insufficient forage.

Using four systems to cope with risk and destock livestock in semi-arid ecosystems, these activities represent mechanisms to allow asset diversification, improved ability to interact with markets, increased investment in rural institutions and commerce, and better capacity to cope with an unpredictable environment. Resource tenure, closer links to markets, rural finance and public service delivery alternatives will likely reduce conflict, improve the economic conditions of pastoralists and their communities, provide higher productivity and stability to their livestock systems and greater protection for the biodiversity in their environments.

Researchers found that pastoralists offer their own probabilistic forecasts, underscoring the fact that they acknowledge and accept forecasts of less- than-perfect skill. They make extensive use of a wide range of

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Two cross-border workshops were organized for pastoralists, development agents, livestock traders, and local government officials from Ethiopia and Kenya. The workshops have been used to transfer skills and knowledge from each side of the border to the other, and have addressed major problems such as drought and cross-border access to grazing and water, marketing, animal health, and conflict. Cross-border committees were formed around the four themes to work on common issues. To assist and oversee their efforts, a steering committee consisting of member from pastoral representatives,

indigenous climate forecasting methods and have considerable confidence in several such methods. The considerably greater appeal to pastoralists of indigenous climate forecast methods generally lies in the higher spatial resolution and wider range of variables they forecast - notably, the onset date of rains and ran-related impact variables such as disease - relative to modern, modeling- based forecasts.

local administration, policy makers, GOs and NGOs in northern Kenya and southern Ethiopia was also formed to maintain and strengthen interaction across the border. As a result, cooperation between pastoralists in both regions is growing and has helped to facilitate peaceful movement of livestock across the border for water and grazing.

Livestock Early Warning Systems (LEWS)

This project addresses risk by combining predictive and spatial characterization technologies with the formation of a network of collection and measurement sites in East Africa. The data from these sites, in coordination with the Famine Early Warning System (FEWS) project, will allow 6-7 weeks of increased lead-time for drought forecasting. GIS co-kriging and kriging techniques are used to extrapolate point-based model output to non-monitored areas. These tools include spatially coherent satellite-based weather data and NDVI greenness data, geospatial tools and Almanac Characterization Tool (ACT), fecal profiling technology near infrared spectroscopy linked with livestock nutritional model and point-based biophysical grazing land model.

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Three NIRS (Near Infrared Reflectance Spectrophotometry) service labs for nutritional monitoring of livestock were established and a network of 30 scientists in the Association for Strengthening Agricultural research in Eastern and Central Africa, a regional association of NARS {National Agricultural Research Systems) were trained to use early warning biophysical models to establish a system for famine warning and management of livestock that will provide an improvement of 6-8 weeks in detecting food problems for humans.

The project also publishes a monthly series of Greater Horn of Africa (GHA) Early Warning Bulletin collaborating with the Drought Monitoring Center - Nairobi, the Famine Early warning Network (FEWS-NET), Regional Center for Mapping of Resources for Development and the U.S. Geological survey. The purpose of the Bulletin is to provide timely and accurate early warning information on food security conditions in the GHA region to decision makers for early and appropriate mitigation and responses. Contact jwstuth@cnrit.tamu.edu for further information.

The Livestock Early Warning System involves linkage of several new technologies capable of predicting forage supply relative to long-term productions and trends in future body condition of livestock using a network of carefully selected household reflecting a variety of effective environments across diverse landscapes of East Africa. The emerging monitoring and analysis system, based on point-based biophysical modeling of emerging forage conditions from satellite based weather data and animal condition from NIRS fecal profiling technology, add a new dimension to the existing monitoring programs in East Africa.

The ability to project responses, such as impending livestock condition, mortality by kind and class of animal, losses in forage supply and decline in body condition or milk production allows more flexibility in decision making from the household level to the policy maker. A timelier movement/destock/restock strategy will allow pastoralists to maintain their assets through crises and relieve pressure on the environment. It will also aid in the assurance of greater ecosystem integrity by allowing more rapid response after droughts have run their cycle.

Integrated Assessment of Pastoral-Wildlife Interactions in East Africa

Addressing the relationship between pastoralists and wildlife conservation in the context of the unpredictability of semi-arid environments, this project will adapt models in use in U.S. national parks to assist policy markers at the national and local levels to establish approaches that are compatible with both pastoral life and conservation of biodiversity. The project intends to identify, in an integrated manner, the trade-offs of different management decisions on wildlife conservation, livestock production and

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The GL-CRSP, in conjunction with the International Livestock Research Institute (ILRI) supported development over the last three years of a new ecological/economic/social model that allows policy makers to understand the impact of policy scenarios for the management of livestock/crop systems in conjunction with conservation areas. Because wildlife, and the tourism it generates, is a leading component of the region's economy while food production is critical to its stability, creative policies must be crafted to balance these often-competing needs. The

pastoralist food security and health.

Integrated Modeling and Assessment System (IMAS) provides this capacity.

Integrated Tools for Livestock Development and Rangeland Conservation in Central Asia
This project emphasizes both adaptation and mitigation and aims to have global and local impacts in four main areas: atmospheric CO2 sequestration, rangeland conservation, enhanced productivity and sustainability of livestock systems, and socio-economic aspects of livestock production. One of the main goals of the project is to assess the regional importance of rangelands and pasturelands in the regulation of atmospheric carbon. Since its inception, the project has obtained detailed information in several sites with rangelands in good condition. As research progresses, typical rangelands are being compared with improved pasturelands and abandoned croplands, in a statistically valid design with replicates. State-of-the-art Eddy covariance measurements systems are being used for this innovative effort which uses the complex measurement systems as roving units instead of stationary ones.

The main objective of these measurements is to assess the variability of CO2 fluxes across different vegetation types such as abandoned, vegetated, and virgin lands. Abandoned lands are those previously cultivated for wheat production and left fallow for the past several years. Revegetated are those that are currently under cultivation with crested wheatgrass for ha production. And virgin, pristine, uncultivated lands are those where native vegetation grows. These types of land cover are representative of the majority of the agricultural land are of Northern Kazakhstan, with exception of areas currently being used for wheat production.

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A network of six scientists and three field sites in Kazakhstan, Uzbekistan and Turkmenistan was established in 1999 to measure net carbon flux in Central Asia. GL-CRSP research indicates that Central Asia rangelands may be a major carbon sink and hold great potential for both mitigation of global warming and future exchange of carbon credits. In addition, a manual for smallholders was published in Russian in Kazakhstan with funding from ILRI and in collaboration with this project which provides simple and brief forage management and animal feeding nformation appropriate for the country. Publication in Kazakh and in English is forthcoming. At a time when extension services are not yet available, and the Soviet agricultural technology infrastructure is no longer in place, this manual provides a basic source of information that producers will be able to consult as needed for current and future conditions. (Contact Nurlan Malmakov at nulan1@nursat.kz for copies.)

Contacts and References:

PLAN Project: Livestock Natural Resource Interfaces at the Internal Frontier Project. Lead Principal Investigator: Dr. Timothy Moermond, University of Wisconsin-Madison. Email contact: tcmoermo@facstaff.wisc.edu.

LDRCT Project: Livestock Development and Rangeland Conservation Tool for Central Asia. Lead Principal Investigator: Dr. Emilio Laca, University of California-Davis. Email contact: ealaca@ucdavis.edu.

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