Table of Contents

A MESSAGE FROM THE DIRECTOR ......................................................... 3

PREFACE ......................................................................................... 4

MANAGEMENT ............................................................................... 5

ADVISORS ................................................................................... 6

ADVISORY BOARD ........................................................................ 7

FOREIGN PARTNERS ..................................................................... 7

OUR IMPACT PATHWAY .................................................................. 9

PROGRAM ACTIVITIES AND HIGHLIGHTS ............................................. 10

PROJECT REGION: EAST ASIA- NEPAL .................................................. 12

NEPAL RESEARCH INNOVATION COORDINATOR ................................. 13

NEPAL INNOVATION COORDINATOR ACCOMPLISHMENTS AND ACTIVITIES........... 13

NEPAL PROJECTS ........................................................................ 14

PROJECT REGION: EAST AFRICA ......................................................... 15

EAST AFRICA RESEARCH INNOVATION COORDINATOR ...................... 16

EAST AFRICA INNOVATION COORDINATOR ACCOMPLISHMENTS AND ACTIVITIES ...16

EAST AFRICA PROJECTS ................................................................... 17

PROJECT REGION: WEST AFRICA ........................................................ 18

WEST AFRICA PROJECTS .................................................................. 19

CAPACITY BUILDING ........................................................................ 20

LIVESTOCK INNOVATION LAB SCHOLAR PROFILES ................................. 21

EAST AFRICA SCHOLARS ................................................................ 23

NEPAL SCHOLARS .......................................................................... 26

OUR COMMUNICATION IMPACT ............................................................ 28

OUTREACH HIGHLIGHTS .................................................................... 30

WEST AFRICA HIGHLIGHTS ................................................................. 31

NEPAL HIGHLIGHTS ........................................................................ 32

RESEARCH BRIEF SUMMARIES ............................................................. 34

PUBLICATIONS AND PRESENTATIONS .................................................... 36
A Message from the Director

Dear Friends,

We have just completed the fourth year of our Innovation Lab for Adapting Livestock Systems to Climate Change, and feel confident that the fifth and final year of this program will continue the tradition of high quality research for development in West Africa, East Africa and Nepal. Since the beginning of this adventure, we have had a stellar cast of investigators from universities across the United States. Those individuals, along with their co-investigators and partners in the U.S and abroad, have done the heavy lifting for this program and I cannot express enough my appreciation for their dedication and hard work. I also would like to thank the graduate students we have supported, several of whom have recently obtained their degree and moved on to new positions. A little over a year ago, we initiated a “Scholars” program in Ethiopia, Kenya and Nepal, for which we competitively awarded funds to advanced graduate students and early career scientists, allowing them to design, implement and report on topics of importance to livestock producers in their countries. In my view, this program has been a spectacular success and has resulted in a number of important impacts on livestock production in the developing world. Short descriptions of the research efforts from our long-term projects, graduate students and Scholars are presented in this report. I encourage readers to examine the research briefs and project descriptions presented on our lcccrsp.org web site. Finally, this program has benefitted greatly from counsel from Joyce Turk and our board of advisors.

The upcoming year will not be dominated by winding the program down, although some of that will occur. Rather, we have funded three new gap-filling initiatives focused on camel diseases and parasitic diseases in Africa. Additionally, we have been so pleased with the Scholars program that many of those projects are being renewed and extended for a second year. We fully anticipate a continual stream of peer-reviewed publications and research briefs over the next 12 months and perhaps more to the point, delineation of new tools and practices that will have substantive positive impacts on the smallholder farmers we are all striving to help with improvements in family nutrition and income.

Dick Bowen, Director
Preface

The goal of the Innovation Lab is to increase resilience and augment the income of livestock producers in regions where agricultural systems are changing, available resources are shrinking, and climate is having an impact.

The Innovation Lab focuses on the following research priorities to achieve its goals:

- Improve the health and productivity of livestock while benefiting the health and welfare of farm families and conserving natural resources.
- Integrate market research with the needs of small-scale farmers.
- Collect and analyze data from farms, partners, and governments that informs evidence-based solutions.
- Increase research capacity through training and educational support.
- Extend the reach of funded research by leveraging resources and partnering with other organizations with similar research and development goals.

The Innovation Lab focuses on the following key principles to achieve its goals:

- We are interested in improving the health and productivity of livestock of the rural poor. We work with small-scale farmers to support their efforts to nourish their families and increase village resiliency.
- We support research informed by the local realities of small-scale farmers. We are interested in evidence-based solutions that are relevant and affordable.
- We are interested in increasing productivity that enhances animal, human, and environmental health. We focus on innovative approaches that increase productivity, enhance health, and conserve resources.
- Women are central to the research that we fund. We recognize that women are fundamental to the success of farm-based initiatives and expect research solutions to address gender gaps and inequalities.

Climate variability is an important determinant of animal, human, and environmental health. Changes in precipitation and temperature can affect the quality and quantity of forage available to animals at times when it is needed most. In addition to facing challenges from a changing climate, populations in South Asia and Sub-Saharan Africa are also undergoing rapid social transformation, facing reductions in communal resources and the reorganization of social obligations, networks, and governance.

Our goal is to increase resilience and augment the income of livestock producers in regions where agricultural systems are changing, available resources are shrinking, and climate is having an impact. We support research that aids individuals and communities to make choices and take actions that lead to sustainable livelihoods in the face of climate change.
Management

Richard Bowen, Ph.D., DVM, Director: Dr. Bowen is a professor in the Department of Biomedical Sciences and director of the Animal Models Core at the Rocky Mountain Research Center of Excellence for Biodefense and Emerging Infectious Diseases at CSU. Dr. Bowen’s current research interests are focused on viral diseases that affect domestic and wild animals and spillover into human populations such as West Nile Virus, Japanese encephalitis, and avian influenza.

Katie Steneroden, DVM MPH Ph.D., Deputy Director: Dr. Steneroden is a veterinary epidemiologist and public health practitioner who specializes in teaching and training, animal health surveillance and collaborative research at the human-animal interface. She is an Instructor at Colorado State University, Adjunct Instructor in the Colorado School of Public Health and Adjunct Faculty at the Center for Food Security and Public Health at Iowa State University.

Diana Fahrenbruck, Administrative Support: Diana Fahrenbruck is a Research Associate in the Department of Biomedical Sciences in the College of Veterinary Medicine and Biomedical Sciences. She brings her past experience working in business as a project manager and her most recent experience helping reconstruct records for the equine reproduction laboratory.

Leslie Butler, Financial Officer: Leslie Butler is a part-time Administrative Professional in the Department of Biomedical Sciences in the College of Veterinary Medicine and Biomedical Sciences. She brings seven years’ experience working in Sponsored Programs as an Accounting Tech IV and more recently as a General Professional II in the Department of Health and Exercise Science as the Office Manager/Accountant.

Dana Hoag, Ph.D., East Africa Coordinator: Dr. Hoag is a professor in the Department of Agricultural and Resource Economics in the College of Agricultural Sciences at Colorado State University. He has extensive experience in agricultural economics and policy and also serves as an adviser in those areas.

Nicole Gutierrez, Communications Coordinator: Nicole Gutierrez is a Research Associate in the Department of Biomedical Sciences in the College of Veterinary Medicine and Biomedical Sciences. She graduated in the summer of 2012 from CSU with a BFA concentrating in Graphic Design, and is interested in both design and illustration. As the communications coordinator, she is the lead of the communications intern team.
Ricki Watkins, Communications Intern: Ricki Watkins is a junior at CSU, double majoring in Journalism and Technical Communications and Natural Resources Recreation and Tourism. She began working with the program in 2012 and plans to graduate in 2015 and pursue a career in environmental communications.

And a special thanks to our interns Val Ho, MaryAnn Crawford, and Thomas O’Malley for providing support in writing and editing this year’s Annual Report.

Advisors

Tom Hopson, Climate Advisor: Dr. Thomas Hopson is a hydrometeorologist who specializes in daily and seasonal flood forecasting. He earned his B.S. in Physics from Rice University in Houston, TX, his M.S. in Civil Engineering, and a PHD in Astrophysical, Planetary and Atmospheric Sciences from Colorado University in Boulder, CO. Hopson works at the University Corporation for Atmospheric Research (UCAR) on a new flood forecasting program that was first introduced in Bangladesh.

Elizabeth Ryan, Special Advisor on Nutrition: Dr. Elizabeth Ryan is an Assistant Professor of Toxicology and Nutrition at Colorado State University and specializes in blending food, environment and global health into toxicology. She received her B.S. in Environmental Science and Biology from Bowling Green State University in Ohio and her M.S. and Ph.D. from the University of Rochester in Molecular and Environmental Medicine. Dr. Ryan is currently working on three different research programs being funded by Archer Midland, The Bill and Melinda Gates Foundation, and an award from the National Cancer Institute and the National Institute on Health (NCI-NIH).

Sandra Russo, Special Advisor on Gender: Dr. Sandra Russo is the Director of Program Development and Federal Relations in the International Center, and the Associate Director at the Transnational and Global Studies Center at Florida State University. Dr. Russo specializes in gender and water issues, agriculture and the environment. She received her B.S. in Animal Science from Purdue University, her M.S. in Agronomy from Pennsylvania State University, and her Ph.D. in Agronomy from University of Florida. She is currently writing an ecofeminist textbook that emphasizes service learning and activism.

Sangeeta Rao, Statistics Advisor: Dr. Sangeeta Rao is a biostatistician and epidemiologist for the Animal Population Health Institute at Colorado State University. She specializes in salmonella, antimicrobial resistance, and antimicrobial susceptibility testing. Most recently, Dr. Rao has served as an external subject expert at a three-week training in Kathmandu, Nepal to build the capacity of field veterinarians in the concepts and application of epidemiology, particularly with respect to disease surveillance and outbreak investigation.
Advisory Board

Adegola Adesogan, University of Florida, Gainesville, Florida, USA

John Johnson, USDA, Fort Collins, Colorado, USA

Linda Logan, Texas A&M University, College Station, Texas, USA

Alice Pell, Cornell University, Ithaca, New York, USA

Iain Wright, International Livestock Research Institute, Addis Ababa, Ethiopia

Special thanks are due to Tag Demment who resigned from our board this year due to additional duties with the Association of Public and Land-grant Universities.

Foreign Partners

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*Figure 1 Yak grazing in Nepal. Photo credit: Jeeban Panthi.*
Our Impact Pathway

**Along our impact pathway**, we generate crucial questions that 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 empower 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. These changing conditions are varied and include rising 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.

The overall impact of our research portfolio will be measured by how well we align our 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.

*Figure 2 Photo credit: Dana Hoag*
Program Activities and Highlights

Our projects target specific challenges that local communities are being forced to overcome in the face of climate change. These challenges are not unique. Whether working in Southeast Asia or Africa, our researchers are finding ways to adapt current technologies and combine scientific expertise with indigenous knowledge to improve the quality of life and create a sustainable future for pastoralists.

One example of this comes from Kenya where The Kenyan Agricultural Research Institute (KARI) is funding and supporting the implementation of Scholar Moses Lengarite’s recommendations in regards to livestock feed supplementation. His program will be promoted in two different counties in Kenya, and will effect 2000 producers. Families who depend on goat milk for diet and income, struggle to supply adequate feed for their flocks in the dry season. By introducing alternative feed from affordable local plants, Moses was able to increase milk yields up to 45 percent. This program has the potential to increase the health and quality of life for thousands of Kenyans.

Another example of the lasting impact of our research projects comes from Tanzania, where 600 sixth grade students are being trained on how to manage a productive poultry flock. More specifically, students are being taught how to vaccinate chickens for Newcastle disease, implement disease prevention measures, how to house and feed chickens, and basic husbandry of hens and chicks. Ultimately, these children will be able to take the skills they learn in school home with them. There, they will have a real world application and be able to increase the production of their household flocks, in turn increasing household income and quality of life.

In Nepal, program researchers met with policy makers to develop ways to improve weather forecasts. Weather has an extremely significant impact on pastoralists’ abilities to consistently produce the crops needed to feed their livestock. With climate change comes an increase in the amount of extreme weather events, and it has become more and more difficult for pastoralists to prepare for harsh conditions. The meeting produced an action plan to improve weather forecasting in Nepal that includes updating old weather forecasting technology, incorporating existing practices and community knowledge, making weather and climate data easily accessible for the whole community, and policy enhancements that will develop a network of stakeholders devoted to supplying up-to-date and accurate weather information. This action plan is the first step in creating a system to provide early warning so pastoralists can plan their activities accordingly – helping to mitigate the effects of extreme weather.
The work that Feed the Future Innovation Lab researchers do is often recognized by other organizations and publications as valuable and important. Occasionally, because of the success projects have had, a researcher is asked to contribute their expertise to other relevant media. Dr. Layne Coppock, a principal investigator for a long-term research project, was featured as a guest editor for a special edition of the academic journal “Rangelands.” The issue, titled “Women as Change Agents in the World’s Rangelands” focuses on the growing influence women have had on the rangelands around the world. Dr. Coppock’s own research emphasizes capacity building and the role women play as pastoralists in some of the poorest households in Ethiopia. He was honored to be able to expand his influence to an audience outside of his own project and program.
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 also 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. Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change 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.
Nepal Research Innovation Coordinator

Dr. Doj Raj Khanal is a veterinarian and Senior Scientist at the Nepal Agricultural Research Council and serves as Editor and Chief of the Nepalese Veterinary Journal. He received a PhD degree in Japan and has received additional advance training in the U.S. and Israel. He has published widely on diverse topics ranging from livestock nutrition to antibiotic resistance in bacteria to poisonous plants. Dr. Khanal has served as our Resource Innovation Coordinator (RIC coordinator) in Nepal since 2012 and has provided invaluable assistance to our research efforts there, particularly with respect to mentoring and monitoring the Scholars that we fund in that country.

Nepal Innovation Coordinator
Accomplishments and Activities

• Supervised and monitored progress of Scholars and assisted with preparing manuscripts.

• Assisted the external evaluation team in touring several field sites and discussing the program with stakeholders, November 2013.

• Organized presentations by Scholars at the International Conference on Climate Change, Water Resources and Disasters in Mountainous Regions, Kathmandu November 2013.

• Represented the Livestock Innovation Lab and presented at the 10th World Buffalo Congress-2013 and 7th Asian Buffalo Congress, Thailand May 2013.

• Attended and participated in the USAID Innovation Lab Director’s Conference, Kathmandu, February 2014.
Nepal Projects

Poultry Skills for Improving Rural Livelihoods: Health & Livelihood skills for women and children
PI: David Bunn, University of California, Davis
Location: Nepal  Start-End Date: 07/01/2012- 12/31/2014

For livestock holders living in rural areas in Nepal and Tanzania, owning a flock of chickens can make a big difference in quality of life. Raising chickens creates both a reliable source of food and a dependable income since families can sell eggs and the occasional chicken. Women are especially empowered by the income gained from poultry sales. Furthermore, chickens can be a nutritional safety net when larger livestock (cows, goats, etc.) are in poor health due to drought. However, raising chickens can be a challenge. In rural Nepal and Tanzania, up to 80% of birds in a flock are lost to diseases and local predators. Due to these challenges, villagers are not able to benefit from the added nutritional and financial security of raising poultry. David Bunn and Peter Msoffe believe that if villages are educated in improved methods for raising chickens, flocks will begin to thrive. Educational programs include techniques for keeping flocks safe from predators and free of common diseases. With the restoration of healthy, thriving flocks of chickens, impoverished women and children will experience improved nutrition and financial stability.

Improving the Resilience of Mixed Farm Systems to Pending Climate Change in Far Western Nepal
PI: Robert Gillies, Utah State University
Location: Nepal  Start-End Date: 08/01/2012- 04/19/2015

The well-being of livestock animals (and consequently the people who raise them) is very dependent on the weather. Climate change has the potential to alter previously dependable weather patterns – making the difficult life of pastoralists even more unpredictable. Robert Gillies and his team are working in the far western regions of Nepal to analyze patterns of climate change – particularly the monsoonal and winter rains. With this data, Gillies and his colleagues hope to be able to predict future droughts and floods – information that would be invaluable to local pastoralists and livestock holders. Partnerships with regional pastoralists and researchers will help Gillies and his fellow researchers better understand the ways in which droughts and flooding affect food security and nutrition for different villages, and the ways in which villages have coped with droughts in the past.

Improving Nutrition and Productivity of Buffaloes to Adapt to the Impacts of Climate Change in Nepal
PI: Nanda Joshi, Michigan State University
Location: Nepal  Start-End Date: 05/01/2012- 04/19/2015

Buffaloes are a vital resource for families and villages in rural Nepal – they provide more than 70% of the milk and 65% of the meat consumed in this mountain nation. However, due to decreased access to grazing land, decreased soil fertility and land degradation, providing adequate nutrition to buffalo has become a challenge for smallholder livestock owners. Climate change threatens to create additional challenges for livestock owners through increasing temperatures, faster melting glaciers, and unpredictable precipitation. Adapting to these new realities is imperative for farmers and livestock owners in Nepal. Nanda Joshi and a team of researchers are collaborating with local Nepalese agencies to develop new livestock feeding techniques and crops in multiple regions throughout Nepal. This research will help local farmers and livestock owners better adapt to the impacts of climate change by increasing buffalo milk and meat productivity through improved feeding and reproduction strategies.
Adaptive Pathways to Climate Change: Livestock and Livelihoods Systems in Gandaki River Basin
PI: Netra Chhetri, Arizona State University
Location: Nepal  Start-End Date: 08/01/2012-04/19/2015

Netra Chhetri and an interdisciplinary team of Scholars and practitioners are seeking to understand the ways in which farmers and livestock holders adapt to climate change and other livelihood stressors. With this research, Chhetri and his colleagues will provide opportunities for livestock keepers to network with each other to share coping strategies. They also plan to improve the resilience of crop-livestock systems. Chhetri and his fellow researchers will work side by side with local farmers and livestock owners to improve the food security and livelihoods of villagers throughout the Gandaki River Basin.

The Relationship Between Human and Livestock Microbiome, Enteric Pathogens and Diarrhea
PI: Nanda Nanthakumar, Virginia Tech University
Location: Nepal  Start-End Date: 06/01/2013-04/19/2015

Our intestinal tracts are full of bacteria and microbes – most of which are benign or even helpful. However, occasionally people can contract bacteria that cause infection and disease in the gut. These types of bacteria are known as enteric pathogens. Most enteric pathogens have animal origins, and when humans and domesticated animals live in close contact illness can easily pass from animal to human and from human to animal. Nowhere is this dynamic relationship more apparent than in isolated rural settings. Nanda Nanthakumar and his fellow researchers are seeking to better understand how changes in the gut microbiome of humans affect that of their animals – and vice versa. Infants are particularly sensitive to enteric pathogens as their immune systems and gut flora are still developing. This study aims to determine the interdependence of mother, infant and livestock in rural households in Nepal and Uganda. Information on this dynamic relationship may help identify key factors that could reduce intestinal disease for rural villagers.

Adaptation For Climate Change by Livestock Smallholders in the Gandaki River Basin
PI: Nir Krakauer, City University of New York
Location: Nepal  Start-End Date: 8/1/2012-04/19/2015

Due to its prolific mountainous glaciers, Nepal is considered the 4th most vulnerable country to climate change impacts. Nir Krakauer and his research team are working to gain a better understanding of the impact of climate change on livestock and livestock owners in the Gandaki River Basin. In addition to gathering data on weather patterns and their subsequent impact on livestock, Krakauer and his team will work with and train village-based networks to develop strategies that will make livestock systems more resistant to challenges stemming from a changing climate. These strategies will focus on water management, and production of feed and forage land for animals. With these new strategies in place, regional livestock holders will be better able to adapt to unpredictable weather patterns and will experience increased food security.

Project Region: EAST AFRICA
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 Research Innovation Coordinator**

Dr. Solomon Desta holds a BSc and MSc degrees in Agricultural Economics from Addis Ababa University and University of London respectively. He received his Ph.D. in Range Science from Utah State University. He is a co-founder and director of Managing Risk for Improved Livelihoods (MARIL), which has become one of the most respected consultancies in Ethiopia. Dr. Desta has vast practical and applied experience with livestock pastoralists in Africa. He has conducted numerous studies, published widely and advised many government and non-government development agencies about how to improve the livelihoods of local pastoralists. Dr. Desta is the co-author of an article titled “Cross-Border Interaction Spurs Innovation and Hope Among Pastoral And Agro-Pastoral Women of Ethiopia and Kenya” published in December—2013 that has won the EXCEL gold medal from Association Media & Publishing in the US as the best feature article in a journal published by a non-profit organization in 2013. Dr. Desta is the Innovation Lab’s eyes, ears and voice in the region. Working closely with the lab’s East Africa Coordinator, he assures that our projects and Scholars are working together to find commonality that will improve their impact, and that these projects are integrated into the local development community and by local government entities like universities, extension outreach, and departments of agriculture. With his knowledge and contacts the lab has a research program that works together to build lasting capacity and maximum impact, instead of just having 4 regional projects and 11 Scholars.

**East Africa Innovation Coordinator Accomplishments and Activities**

- Assisted regional projects with local logistics including networking, finding local resources, and coordinating with local project leaders and US investigators.
• Integrated Scholars into regional projects - Scholars provided local knowledge as well as helping with research.
• Hosted “All Scientist Meeting” - travel, hospitality, and content
• Facilitated key meetings between USAID mission staff and others for the Innovation Lab
• Evaluated Scholar applications and Camel regional project applications
• Personal mentor to several east African Scholars
• Arranged a special program slot for Scholars to present their findings at the 6th All Africa Conference on Animal Agriculture in Nairobi, Kenya

**East Africa Projects**

**Sustainable Pastoralism on the Boran a Plateau: An Innovation Systems Approach**  
**PI:** Layne Coppock, Utah State University  
**Location:** Ethiopia  
**Start-End Date** 08/01/2012- 04/19/2015

The Borana plateau region in southern Ethiopia was once a thriving pastoral system, sustaining vast herds of cattle and many pastoralists. Over the last several decades, increased human population, an increasingly dry climate, and the degradation of rangeland have decimated this once thriving pastoral system. Herders who were once sustained by this land are now poverty-stricken and food-insecure. The traditional ways in which livestock were raised in this region are no longer sustainable. Layne Coppock and his team plan to work with communities in the Borana plateau to develop a new land and livestock interventions that will contribute to making the pastoral system sustainable once again. The research team will work side by side with local pastoralists and researchers to create solutions that are long lasting, and work for everyone. The impact of this research has the potential to spread beyond the Borana plateau and benefit livestock holders all over the Greater Horn of Africa.

**Climate-induced Vulnerability & Pastoralist Livestock Marketing Chains in the Horn of Africa**  
**PI:** Peter Little, Emory University  
**Location:** Ethiopia, Kenya  
**Start-End Date** 11/01/2011- 04/19/2015

For livestock owners to thrive, they need access not only to food and water supplies for their herds, but also to markets where they can sell their animals. Climate change and variability impacts livestock production on all levels, including the ability of pastoralists to bring their animals to market. Southern Ethiopia and northeastern Kenya are regions that have experienced a series of severe droughts, leading to a humanitarian crisis. Little is understood about how these challenges have impacted poor herders’ ability to access different markets so they can trade and sell their animals. Peter Little, Workneh Negatu and Polly Erickson are using household surveys, ethnography and market chain and spatial analyses to better understand herders’ and traders’ relationship with local markets. This research will contribute to the formation of policy recommendations that will strengthen livestock markets in the region.

**Strengthening Tanzanian Livestock Health and Pastoralist Nutrition and Livelihoods in a Changing Climate (HALI2)**  
**PI:** Jonna Mazet, University of California at Davis  
**Location:** Tanzania  
**Start-End Date** 11/01/2012- 04/19/2015

East African pastoralists and the livestock integral to their food security, culture, and livelihoods are vulnerable to climate-change driven alterations in resource availability and disease transmission. In the rural villages bordering Ruaha National Park in Tanzania, pastoralist communities already face pasture and water scarcity and high disease
losses in their herds. Jonna Mazet, Liz VanWormer, Chris Gustafson and their team of researchers are conducting a long-term project to assess the impacts of education on livestock health and human nutrition. This education will increase the resiliency of pastoral communities that are severely affected by climate change.

**Camel Adaptation and Medicine in the East-African Land Scape (CAMELS)**

**PI:** Paul Plummer, Iowa State University  
**Location:** Ethiopia  
**Start-End Date:** 2/01/2014-4/01/2015

Camels are an increasingly important livestock animal for pastoralists in East Africa. Unfortunately, the development of camel-specific veterinary diagnostic services has not kept pace with the growth of this livestock sector. The objective of Dr. Plummer and his co-investigators Drs. Yaeger, Mckonnen and Coatney is to improve the diagnostic medicine capacity for camels of Ethiopia. Plummer and his fellow researchers see collaboration with local pastoralists, veterinarians and researchers as a critical component of their research and the only way to achieve sustainable change. Throughout their research, Plummer and his team will work to understand the needs to the villages they are serving, determine which diseases and ailments are most common in local camel populations, and build a veterinary reference laboratory that will service 11 counties in East Africa.

**Project Region: WEST AFRICA**
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 also 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 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.

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, 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. SDSU researcher Paul Shepland, in collaboration with 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.

West Africa Projects

Climate change, pastoral resources and livestock in the Sahel: developing a community relevant pastoral prediction system

PI: Niall Hanan, South Dakota State University

Location: West Africa Start-End Date 11/01/2011- 04/19/2015

In West Africa, the way that farmers and pastoralists utilize their land is changing. We have a very limited understanding of how these changes will affect and be affected by climate change. Niall Hanan and a diverse team of researchers from both West African and the United States are seeking to fill this knowledge gap by studying rural communities in Senegal. The researchers are developing an integrated pastoral systems simulation model that will predict how climate and land-use changes will impact livestock production and subsequently the people who depend on livestock for their survival. The model focuses on grazing resources, water resources and the seasonal movement of people with their livestock. Hanan and his colleagues will work to translate their scientific research into concrete action steps that will help poor communities prepare for and adapt to climate and land-use change.

Riverine Management Systems for the Future
PI: John McPeak, Syracuse University

Location: West Africa Start-End Date 01/01/2013- 04/19/2015

Access to fresh water in arid and semi-arid lands is a critical component of both farming and livestock production. Two rivers in West Africa, the Senegal and the Niger, have had their water sources stressed due to a combination of changing rainfall patterns and increased population. This challenge has a huge impact on farmers, who need the water source for their crops, and pastoralists, who often move their herds along the river between seasonal grazing areas. Scientists predict that the challenges faced by farmers and pastoralists in the Senegal and Niger river basins will occur in the future in areas with similar environments. John McPeak and his fellow researchers are seeking to understand how the changing riverine systems have impacted both farmers and pastoralists. McPeak and his colleagues will partner with students from universities in Mali and Senegal to discover strategies that may help local farmers and herders improve their resilience in the face of these changing rivers.

Capacity Building
Training of young scientists, graduate students, livestock owners and even grade school children is an integral part of the Livestock Innovation Lab and one of our highest priorities. Early in the course of this program, we funded a number of graduate students in West and East Africa. Those students have finished their programs and gone on to other endeavors, mostly in their home countries. Farmer training is conducted most frequently by workshops organized by our PIs, and to understand the reference to training grade school children, please examine the description of David Bunn’s projects in Tanzania and Nepal above.

Last year, our focus for capacity building changed to the Scholars program, as detailed in the next section of this report. The Scholars program has two fundamental objectives. First and foremost, our goal is to provide experience to this group of young scientists – experience in proposal writing, designing valid experiments, conducting research, analyzing data and preparing manuscripts and research briefs for publication. In essence, our agenda is to provide these young men and women the opportunities to become players in the international livestock research arena. Our second goal is to obtain substantive research impacts from the Scholar projects. We judge the Scholars program to be a resounding success, to the point where we are renewing many of the projects and adding additional Scholars to the program. Finally, each of the Scholars is affiliated with an educational or governmental organization and their contributions to institutional capacity building is substantial.

Livestock Innovation Lab Scholar Profiles
The Livestock Innovation Lab Scholars program identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.

Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, the Scholars are expected to demonstrate concrete outcomes and real potential for future impact.

Figure 11 Kenya, 2013. Sample recording. Photo Credit: Bulle Hallo Dabasso.
East Africa Scholars

Bulle Hallo Dabasso
Assessing Carbon Stocks and its Economic Potential in Communal Grazing Areas of Marsabit, Northern Kenya

Samuel Tuffa Kawi
Estimating Rangeland Grass Productivity under Different Herbivore Pressure and Climate Change Scenarios

Peter Obimbo Lamuka
Antimicrobial Resistance among Zoonotic Organisms in Camel Ecosystem and Consequences on Pastoralists’ Public Health and Livelihoods

Moses Lengarite
Improved Processing and Storage of Local Supplementary Feeds for Feeding Livestock During Drought and Dry Season in Northern Kenya

Akilu Nigussie Megos
Women’s Workload and their Role in Livestock Production in Afar Regional State

Melaku Berhe Redda
The Livelihood Effects of Landless Cattle Owners’ Participation on Hillside Rehabilitation in Tigray, Ethiopia

Margaret Syomiti
Introduction and evaluation of fodder-block technology and cactu-Atriplex spp.

Beyene Teklu
Dynamics of Production and Livelihood Systems of Settling Pastoralists in the Dry Lands of Southern Ethiopia

Habtamu Tassew Tarekegn Teklu
Promoting Food Safety and Security Through Improving Camel Health and Production in Pastoral Areas of Ethiopia

Archalew Tsegahun
The Use of Sorghum Silage in Developing Silage-Based Feeding Practice to Mitigate the Effects of Climate Change in Shoa Robit, Ethiopia

Yibeltal Tebikew Wassie
Prospects of Communal Natural Resource Management Systems and Livelihoods of Borana Pastoralists in the Face of Climate Change, Southern Ethiopia
East Africa Scholar Accomplishments

The East Africa Scholar program began in 2012 with a competitive call for proposals that yielded 11 Scholars. Scholars were gathered to present their work to each other and to a carefully chosen group of established researchers from various disciplines that could act as mentors. During this process they revised their proposals to be more realistic and ultimately more publishable. Mentors helped with economics, range science, animal nutrition, statistics and participatory research, as well as advice about being successful in research. Seven months later, the Scholars gathered again to present their work. This meeting allowed for further refinements based on comments from their peers researching similar issues and resulted in some collaboration across projects. In the final phase, each Scholar received personalized mentoring on how to publish, including how to choose a journal and how to succeed in publishing in that journal.

A condition of receiving fellowships was that each Scholar present their work at professional meetings and that they submit a competitive article to a journal. Eight Scholars have articles accepted or in review. Finally, our East Africa RIC coordinator, Dr. Solomon Desta, has arranged for Scholars to present their findings in two special sessions at the 6th All Africa Conference on Animal Agriculture in Nairobi, Kenya in October 2014. This will serve as a showcase for what the Scholars have achieved. They will present the same information a week earlier in Addis Ababa to the local research and development community.

These Scholars have made significant research advancements in improving the food security, health and livelihoods of thousands of pastoralists across East Africa in the face of climate change. Together the projects serve an expansive geographical landscape, from the Borana Plateau in Southern Ethiopia to the Marsabit District in Northern Kenya. Scholars applied a variety of different strategies to better understand their specific research problem. Six of eleven Scholars utilized experimental research strategies, while the other five collected qualitative data using surveys and focus groups. Based on the findings of their research, the Scholars have suggested possible solutions, such as policy changes, new technologies, capacity building, and future research themes. Using creative and evidence-based solutions, their projects aim to solve a range of issues facing East African pastoralists, such as changes in traditional livestock systems, increases in women’s workloads, losses of feed availability and nutrition, and reductions in mobility due to land fragmentation.
Innovation Lab Scholars have tackled important research topics and have learned valuable lessons that can help improve the lives and livelihoods of pastoralists. The Scholars have become recognized experts with new opportunities to advise governments and stakeholders alike. Capacity has been increased in a natural organic manner with lasting effects.

Figure 14 Camels in Ethiopia. Photo credit: Dana Hoag
Nepal Scholars

Amit Adhikari
Impacts of climate change on soil health and livestock productivity, and the climate change adaptation

Dilli Bhattarai
Measuring Resiliency in Sheep Production Systems

Tapendra Bohara
Tracking Changes in the Incidence of Tick and Tick-borne Diseases

Rupendra Chaulagain
Developing Country-specific Diagnostic Tools for Brucellosis

Bhojan Dhakal
Forage biodiversity, feed supply, and livestock rearing

Tara Gaire
Impact Assessment of Climate change on Animal Health and Vector borne Zoonotic Disease

Narayan Paudyal
Documenting the Major Causes of Assessing the Impact and Spread of Parthenium hysterophorus

Meera Prajapati
Assessing the Possibility of Nipah Virus Outbreaks in Nepal

Shah Shatrughan
Immune Response of Heat-stressed Broiler Chickens

Renu Shakya
Linking Ecosystem Health with Measures of Animal and Human Health

Muna Sharma
Measuring the Impact of Degraded Ecosystem Health on Livestock Livelihood

Nabaraj Shrestha
Assessing the Impact of Higher Temperatures on Poultry Production

Prazila Sherertha
Study on Zoonotic important species Salmonella infection in Backyard poultry.

Sulochana Shrestha
Documenting the Disease Dynamics of Goats in the Rugged Landscapes of Nepal

Upendra Thapa Shrestha
Measuring the Impact of Parasites on the Growth of the Swine Industry in Nepal
Suraj Subedi  
Introducing improved pasture management within the Community Forest

Suyog Subedi  
Assessing the Impact of Changing Climatic Conditions on Toxoplasmosis

Ganga Prasad Yadav  
Measuring Lantana camara Incursion in Chitwan National Park Buffer Zone
Our Communication Impact

The Communication team strives to disseminate Innovation Lab research, updates and goals to our key audiences. The team is made up of three interns and one contractor and is led by the communication coordinator Nicole Gutierrez. This year, the Communications team has been working hard to further expand the Innovation Lab’s messages through timely news reports, engaging social media updates, and our recently-redesigned LCCCRSP.org website.

With so many final reports coming in from our Scholar program, the team created a new research brief template unique to the program. These briefs summarize each Scholar’s research in an easy-to-read, 3 to 4 page format that can be published, printed and distributed. Between May 2013-May 2014, the team has edited and designed eight NEW Scholar research briefs and four new long-term research briefs.

Along with producing new research briefs, our team wrote news features based on conferences attended, trip reports from our researchers and highlights from our program. These news items were shared on the website homepage and posted through our social media outlets. We created 45 individually written news posts this past year, along with unique website banners for new publications and important announcements.

Social media is a growing and successful platform, allowing organizations to reach a large and diverse audience quickly and efficiently. This new media platform puts a more personal face on a company, making it more relatable to the target audience. From our research, it appears that more personal posts presented in a less business-like manner receive the most engagement (hits) from users. One of our most successful new features has been the “Innovator of the Month,” in which an Innovation Lab member is highlighted for his/her outstanding contributions to our program. Using a combination of a hashtag (#) and photo, our most recent Innovator of the Month post reached a record 591 people. This year, we have increased our Facebook likes by 13 percent, our Twitter following by 16 percent and LinkedIn following by 19 percent. Based on our social media analytics, posts with hashtags receive the most views, while posts with photos get the most engagement. While people in the United States seem to favor Twitter, we have tripled the number of our Nepali Facebook followers. Our goal this year will be to create a detailed record of all website and social media data in order to discover more about the interests of our audience so that messages can be targeted more effectively.

Recently, we reorganized the website to make it more user friendly. We removed all unnecessary pages and combined and condensed others to make the website as a whole more easily navigated. Along the lines of making the website more organized, we have created a new page called “Research Projects” that lays out all of our projects on one page in the form of clickable links. This page features specific information on each long-term, Scholar and Fellow project, along with corresponding news postings. Each project page also has an interactive map of the region where the project is located, marked with the areas that the project researchers have visited.
We also redesigned and relaunched the Research Communique, our monthly newsletter, to make it easier to update and more visually engaging. It was reorganized into sections that include recent activities, development and funding opportunities. It is now archived on the “Research Communique” page of our website and is sent out monthly.

In the coming year we will focus more on social media and documenting corresponding data in order to create more successful postings. We will also be monitoring website page views and hits to see what people are most interested in on our website, as well as which parts could be enhanced to be more successful.

Figure 16 Capacity building poster created for the BIFAD meeting in Des Moines in October 2013. Designed by Nicole Gutierrez.
Outreach Highlights

Researchers, Scholars and Feed the Future Innovation Lab staff have had a productive year attending and presenting research results at conferences, conducting workshops, building their network, publishing journal articles, book chapters and research briefs, and speaking to partners and stakeholder groups on the collaborative work done by the Innovation Lab. Highlights of those activities are presented below.

East Africa Highlights

Scholars

- May 23-25, 2013 marked the first All Scientist Meeting for the East African Scholars, held in Addis Ababa, Ethiopia. Nine Scholars presented their work, which ranged from studies on women’s workload in crop and livestock production, zoonotic disease and antimicrobial resistance in camels, use of novel food sources for goats, and rangeland grass productivity under different climate change scenarios. An overview and update was also given by two regional projects, the CHAINS (climate-induced vulnerability and pastoralist livestock marketing chains) project by lead PI Dr. Peter Little and the Kalo project leg by Dr. Layne Coppock.

- The University of Nairobi Centre for Sustainable Dryland Ecosystems and Societies held a student-led conference May 29-30, 2013. Two Scholars presented their studies at the “Transformative Education, Research and Engagement for Drylands Resilience and Sustainability conference on pastoral public health and livelihood relating to zoonotic organisms and adaption strategies in livestock feeds and feeding.

- Dr. Mark Nanyingi, a doctorate fellow at Colorado State University and University of Nairobi, presented his findings on how to forecast and control Rift Valley Fever (RVF) at The 47th Kenya Veterinary Association Scientific Conference in Mombasa, Kenya that brought local and international experts together to share information on veterinary medicines and related disciplines.

- Six manuscripts have been completed submitted or accepted for peer reviewed publication by our East African research Scholars. This research will appear in a variety of journals including: The Journal of Pastoralism: Research, Policy and Practice, Agricultural Science Research Journal, Journal of Rangeland Ecology and Management, Journal of Development and Agricultural Economics, and the Journal of Microbiology Research.

Lead Researchers

- Massai Voices on Climate Change (And other changes, too),” a 10-minute participatory documentary funded by the Livestock Innovation Lab, received the Jean Rouch Award for Collaborative Filmmaking by the Society for Visual Anthropology, a division of the American Anthropological Association. Entirely written, directed, filmed and edited by Maasai pastoralists from the Maasai Mara in eastern Kenya, the participatory video portrays climate change through the eyes of the people that rely on the land for their livelihoods. This video was part of an Innovation Lab project “Pastoral Transformations to Resilient Futures: Understanding Climate from the Ground Up” by lead PI Kathleen Galvin, Colorado State University.

- Layne Coppock, a principal investigator for Feed the Future Innovation Lab, was the lead guest editor for a special issue of Rangelands. “Women as Change Agents in the World’s Rangelands” focused on the growing influence women have had in the range profession in the US and around the world. This special issue was sponsored by USAID, and comes full of stories that illustrate the evolution of women’s roles as rangeland educators, researchers, and stewards of one of the world’s most important natural resources. The purpose this issue is to highlight the importance of women in the world’s rangelands systems so that we can collectively transform ideas about what is “normal” for women to do, and close the gender gaps that impede cultural and agricultural progress on a massive scale.
During the Feed the Future Food Security Innovation Labs Meeting, March 5-7, 2013 in Morogoro, Tanzania, lead researchers presented updates and topic overviews of their work with the HALI2 (strengthening livestock health and pastoral livelihoods) project. At the All Scientist Meeting in Addis Ababa in May 2013, lead researchers presented updates and overviews of the CHAINS project which focuses on pastoralist livestock marketing chains and KALO (livestock production) projects.

Nineteen students and faculty members from Addis Ababa University and The Carter Center were trained in the use of GIS and spatial analysis as part of an Innovation Lab-funded project. GIS will play an important role in this on-going Innovation Lab project focused on determining the impacts of climate variability and other changes on pastoralists’ profitability in livestock market chains in Ethiopia and Kenya. Specifically, researchers will map out the location and use of water wells, the location of livestock markets and the movement of cattle to and from markets. Pastoralists and local traders will then use this information to better manage their herds and adapt to a changing climate.

Surveys were completed in female and child nutrition, and baseline livestock health and pastoralist livelihood in 2013, along with a workshop on water management and pastoralist household livelihoods. In addition, several manuscripts are in preparation or published are listed in the publication section.

Lead CHAINS researcher Dr. Peter Little published two book chapters in 2013 on cross-border livestock trade and reflections on the future of pastoralism in the horn of Africa. Researcher collaborations with CGIAR, and FAO and resulted in publication of an ILRI research brief on market access and trade issues affecting the Drylands in the Horn of Africa. HALI2 researcher Dr. Christopher Gustafson presented a seminar at the University of Nebraska-Lincoln on “Health, Beliefs, and Knowledge” on May 15, 2013.

Chris Gustafson, the lead PI for HALI2 visited the Pawaga and Idodi Divisions of Tanzania to conduct Environmental Education curriculum development discussions.

Researchers partnered with Peace Corps volunteers to provide a 5-day poultry skills training workshop to 22 farmers in Tanzania.


Dr. Mark Nanyingi, a doctorate fellow at Colorado State University and University of Nairobi, presented his findings on how to forecast and control Rift Valley Fever (RVF) at the The 47th Kenya Veterinary Association Scientific Conference in Mombasa, Kenya in April 2013, that brought together local and international experts together to share information on veterinary medicines and related disciplines.

Two participatory Rural appraisal workshops were conducted with 18 trainees with a variety of NGO’s including CARE Ethiopia, Action for Development (ACFODE) a women’s development group, and SOS-Sahel to determine top research priorities for livestock.

**West Africa Highlights**

Peter Shapland, Feed the Future Innovation Lab researcher traveled between Senegal and Mali to follow up on the many ongoing facets of the projects in West Africa. While he was there, he created action plans and contracts for 2014 with their NGO partners, The Centre d’Etudes et de Promotion Agropastorale (CEPAP) in Nioro and The Association pour le Développement Intégré dans la Savane et au Sahel (ADISSAH) in Diema. Shapland also conducted training for surveyors and visited Northwestern Mali to implement the anthropometric analysis, a measurement of the nutritional status of children 6-60 months, and conduct gender focus groups. Finally, Shapland worked more on the year’s action plan with the University of Bamako and the Institute of Polytechnique Rural.
To quote researcher Peer Shapland “In order to create a sustainable impact, we need to infuse our research and development methods into our partners’ long-term programs.” “The research and outreach programs of our partners are much bigger than ours — incorporating our program into theirs will expand our impact. Our NGO partners are the local actors and experts who have developed relationships and trust with local communities — all of our outreach goes through them.” In addition to above mentioned partners, collaborations also include: Centre international Pour La Recherche Agricole pour la Development (CIRAD), Centre de Suivi Ecologique a Senegalese research institute and potentially AfricaAdapt and finally a herder association Association Nationale pour la Promotion de l’Elevage au Senegal. As Shapland states “our projects success hinges on our partnerships with local researchers and NGO’s.”

Thirteen Scholars were trained in an agro-meteorological modeling tool (aWhere), an extremely powerful tool to add value to their proposals and project implementation.

A 2-day workshop with 35 transhumant pastoralists was conducted to enhance ideas and adaption methods. Agronomes et Vétérinaires Sans Frontières (Veterinarians Without Boarders) provided animal health training.

A Scholar team conference and 2 day training for NGO partners in Dakar was conducted in qualitative research methods, nutrition training, methods for leading a gender focus group, and methods for conducting climate change workshops for local communities.

Nepal Highlights

In both Nepal and Tanzania nearly 1000 sixth graders from 16 different schools have been trained on poultry skills. These students learned important lessons on poultry disease prevention and husbandry that they apply at home.

Livestock Innovation lab researchers met with policy makers to develop ways to improve weather forecasts in Nepal. Up-to-date weather and forecast data is critical to farmers whose livelihoods depend upon ideal climate conditions to grow crops and raise livestock. Without these technologies, preparing for and adapting to extreme weather events caused by climate change becomes increasingly difficult. Unfortunately, Nepal’s complex topography and lack of modern technology decreases the accuracy, ease and usefulness of current weather forecasts. To address these challenges, senior scientists, policy makers and researchers in Nepal met in March 2013 in Kathmandu to discuss potential solutions and a way forward. Organized in joint by the Small Earth Nepal (SEN), the Department of Hydrology and Meteorology (DHM) and the Government of Nepal, this “Weather Café” revolved around the theme of “watching the weather to protect life and property” to celebrate the World Meteorological Day – 2013. “The Weather Café aimed to provide a common forum to scientists and researchers sharing their experiences on the evolution, status and challenges of weather forecast in Nepal and its importance in climate change adaptation with a special focus on water and water-related impacts of climate change. In addition to providing scientists and researchers in the weather and climate sector an opportunity to brainstorm innovative solutions, the Weather Café gave policy makers critical insight into areas where current policy is lacking or constraining.

Researchers working on the project Improving Nutrition and Productivity of Buffaloes to adapt to the Impacts of Climate Change in Nepal, traveled along with Nepali farmers to several different regions of Nepal to bring different groups of farmers together so that they could learn from each other and become aware of the potential of dairy farming with forage based feeding systems.

The Asian Institute of Technology and Management featured a seminar on remote sensing hosted by Livestock Innovation Lab researchers focused on helping livestock smallholders in Nepal’s Gandaki River Basin adapt to climate change. Over 40 participants attended the seminar on the use of remote sensing and aerial technology to collect information for the hydrology and water resources sectors.
- Nepali pig farmers learned management techniques and received anti-parasitic medications from Scholar and faculty member at Kantipur College of Medical Sciences.

- Transfer of climate-adaptive feed technologies to farmers through experimental demonstration sites are set up to teach local farmers how to increase the productivity of their livestock feed operation in Nepal.

- Research that will more accurately predict rainfall in Nepal and help livestock holders better prepare was published in the International Journal of Climatology and the Climate Dynamics Journal.

**Feed the Future Staff Outreach Activities**

- On April 2nd 2014, the Peace Corp-USAID Campus Food Security Tour stopped by Colorado State University to help share information about how students can become engaged with efforts to fight global hunger and poverty. Dr. Richard Bowen, Feed the Future Innovation Lab on Livestock’s Director, gave a speech highlighting the work that the program does and the impact it has made around the world.

- Dr. Bowen presented a seminar describing our activities on April 9th, 2014 at the Symposium “Future of Africa Under Global Environmental Change”

- Feed the Future Innovation Lab staff member Shana Gillette and USAID senior livestock specialist Joyce Turk were part of a panel for Colorado State University’s First International Colloquium on One Health. Their session “Redefining how we talk about health in the 21st Century: the role of One Health” included speakers from the National Institutes of Health, George Washington University and the University of Denver. The 3-day Colloquium provided students, faculty and the public with the opportunity to learn more about Global One Health and the important issues surrounding the interconnectivity of human, animal and environmental health. Topics ranged from depleting resources and emerging health threats, to finding solutions and optimizing health.

- The Innovation Lab Council, including Director Dick Bowen, Co-Director Shana Gillette and Communications Manager Nicole Gutierrez convened at the World Food Prize Symposium in Des Moines in October 2013 to share progress and coordinate future activities. The government shutdown forced a cancellation of BIFAD (Board for International Food and Agricultural Development) meetings, however the Chair Brady Deaton visited with the Council to discuss higher education initiatives, food insecurity and international development.
Research Brief Summaries

Research Briefs are published on the Feed The Future Innovation Lab website to inform stakeholders, students, future Scholars on projects, results, impacts and new directions our researchers and Scholars are taking their work. These concise and informative reports provide an accessible tool to highlight our work and carry the message to future researchers.

Pastoral Transformations to Resilient Futures: Understanding Climate from the Ground Up (RB-10-2013)
Changes in climate, human population and land-use threaten the health and sustainability of livestock systems in East Africa. During a two-day workshop with Innovation Lab researchers, almost 30 pastoralists from the Athi-Kaputiei Plains and the Greater Mara Ecosystem in the MassaBlands of Kenya discussed their perceptions of these changes and resulting impacts on livestock production, the environment and the economy. The pastoralists also suggested and discussed solutions, such as feed storage, that may mitigate the negative effects of these changes. Videos filmed for this project can be found at… http://www.lcccrsp.org/2013/09/screening-of-maasai-voices-on-climate-change

Climate Change, Pastoral Resources and Livestock in the Sahel (RB-11-2013)
Innovation Lab researchers in Mali work to predict and model how the combined effects of climate and land-use change will impact livestock production in West Africa in the coming years. The researchers plan to produce informational products from the research results that pastoralists can draw from in order to better adapt to and understand the changing landscape.

Climate Change and Other Factors Degrade Nepalese Livestock Systems (RB-12-2013)
Climate change, along with other factors, such as deforestation and land-use changes, threaten to degrade the health of mixed-farming systems in Nepal. Innovation Lab researchers developed and organized several trainings for farmers based on problem areas identified by earlier data collection. These trainings, which focused on expanding livestock productivity, formulating nutritional feed and treating animals for disease, provided more than 350 households the skill set and knowledge to sustainably adapt to their changing world.

Influences of Climate, Coping Strategies and Middle Eastern Markets on the Livestock Trade in Southern Ethiopia: Preliminary Observations (RB-13-2013)
Pastoralism, which provides a livelihood for millions of people occupying the drylands of Eastern Africa, is but one component in a complex international livestock market chain. However, many small-scale livestock producers (pastoralists), in the face of difficult challenges, remain unable to take advantage of this growing market. Market off-take rates among many Borana pastoralists of southern Ethiopia remain stagnant, even with export increases, resulting in a lack of sustained quantity of marketable animals.

Improving Nutrition and Productivity of Buffaloes to Adapt to the Impacts of Climate Change in Nepal (RB-14-2013)
As the climate changes, farmers in Nepal struggle to find forage for their buffaloes, which account for more than half of the milk and meat production of large ruminants in the country. A Livestock Innovation Lab-funded project is working with 90 farmers to develop strategies and methods to increase forage availability and nutrition and improve buffalo reproduction and productivity.

Pastoralist Perspectives on Livestock Health, Livelihood Improvement, and Environmental Change in Rural Tanzania (RB-15-2014)
East African pastoralists and the livestock integral to their food security, culture, and livelihoods are vulnerable to climate-change driven alterations in resource availability and disease transmission. In the rural villages bordering Ruaha National Park (RNP) in Tanzania, pastoralist communities already face pasture and water scarcity and high disease losses in their herds. As part of a long-term project to assess the impacts of education on livestock health, human nutrition, and pastoralist livelihoods, researchers conducted focus groups with diverse pastoralist representatives from 21 villages bordering RNP. These focus groups were designed to validate priority livestock health concerns with a broad sample of pastoralists in order to develop locally relevant education.
Sero-epidemiological Study of Camel Brucellosis in Mehoni District, South Eastern Tigray, Ethiopia (TRB-01-2014)

Adapted to the arid climates of Ethiopia, camels serve as a vital domestic animal species for pastoralists, who rely on the animals for food security. However, infectious diseases such as brucellosis can have considerable impacts on both camel and human health. In an analysis of 450 blood samples collected from animals in the Mehoni district of northeastern Ethiopia, researchers determined the number of camels and goats that tested positive for brucellosis (i.e., sero-prevalence) in the region and identified the potential risk factors associated with the occurrence of the disease.

Implications of Constrained Mobility on Livestock Production and Pastoral Livelihoods of Borana Plateau, Southern Ethiopia (TRB-02-2014)

In the arid and semi-arid pastoral systems of Borana, livestock mobility has been a means of utilizing pasture and water available across heterogeneous landscapes. Even though mobility has long been the key to maintaining pastoral livelihoods in dynamic rangelands characterized by high climatic and ecological uncertainty, expanding crop cultivation in pastoral areas is causing land fragmentation and thereby removing the most productive lands from the grazing herds.

How much is Pastoral Ecosystem in Northern Kenya Contributing to Climate Change Mitigation Through Carbon Sequestration? (TRB-03-2014)

Pastoralism serves as a primary livelihood for many people in northern Kenya. However, governments, under the assumption that pastoralism is environmentally destructive, are discouraging pastoralism as a land use. This assumption, however, is unsupported. Carbon sequestration through sustainable rangeland and livestock management practices could actually help to reduce greenhouse gas emissions and climate change mitigation. This study aims to assess carbon sequestration potential in the semi-arid pastoral ecosystems of northern Kenya by taking into account the spatial and temporal variability of range resources.

The Livelihood Effects of Landless Cattle Owners’ Participation in Hillside Rehabilitation in Tigray, Ethiopia (TRB-04-2014)

As many landless cattle owners in the Tigray Regional State in Ethiopia do not possess land grants, the regional government distributed bared communal hillside areas to them. In this act, the government hoped to give landless cattle owners the ability to supplement their incomes while also renovating the degraded hillsides. To determine if cattle owners have participated in hillside conservation and if their livelihoods have been impacted, researchers randomly selected 450 people from six districts to participate in semi-structured questionnaires.

Impacts of Change in Customary Rangeland Governance Institutions on Pastoral Livelihoods of the Borana Plateau, Southern Ethiopia

Pastoralism is founded on extensive livestock keeping, seasonal herd mobility, and flexible resource use and is governed by strong customary institutions known as the ‘the Gadaa System.’ It has endured for centuries as the major livelihood strategy for Borana pastoralists in Southern Ethiopia. However, today, these age-old pastoral systems and core customary institutions are under mounting pressure from a multitude of stressors. In particular, recent changes in government policies, notably establishment of peasant associations and expansion of agriculture, are affecting the livelihoods and rangeland use arrangements of the area.
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