



**FEED THE FUTURE INNOVATION LAB FOR LIVESTOCK SYSTEMS  
ANNUAL REPORT (FY 2017)  
NOVEMBER 2017**

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*Sustainably intensifying smallholder livestock systems to improve human nutrition, health, and incomes*

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**Disclaimer**

This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID) and its Feed the Future Innovation Lab for Livestock Systems managed by the University of Florida and the International Livestock Research Institute. The contents are the responsibility of the University of Florida and do not necessarily reflect the views of USAID or the United States Government.

## Management Entity Information

At the end of FY 2017, the Feed the Future Innovation Lab for Livestock Systems Management Entity (ME) core team consisted of eight full-time and three part-time staff, and 10 faculty members led the Areas of Inquiry (AOIs), Cross-cutting Themes (CCTs), and Monitoring and Evaluation efforts.

**Table 1: The Management Entity Core Team, as of September 30, 2017**

Name	Position
<b>Dr. Adegbola Adesogan</b>	Director
<b>Dr. Marjatta Eilittä</b>	Deputy Director
<b>Nargiza Ludgate</b>	Chief Financial Officer
<b>Saskia Hendrickx</b>	Project Coordinator
<b>Brigitte Pfluger</b>	Monitoring and Evaluation and Impact Specialist
<b>James Harper</b>	Marketing and Communications Specialist
<b>Cynthia Hernández-Cardec</b>	Admin/ Fiscal Assistant
<b>Dr. Zeleke Mekuriaw</b>	Regional Coordinator, East Africa (Ethiopia and Rwanda)*
<b>Varijaksha Padmakumar</b>	Regional Coordinator, Asia (Cambodia and Nepal) (part-time)*
<b>Dr. Isidore Gnanda</b>	Country Coordinator, Burkina Faso (part-time)*
<b>Dr. Moctar Karimou</b>	Country Coordinator, Niger (part-time)*

\*Hired by ILRI. Other core staff listed are with the University of Florida.

**Table 2: Management Entity Faculty Members**

Name	Position
<b>Dr. Geoffrey Dahl</b>	Leader, Animal-Source Food Production and Marketing AOI
<b>Dr. Arie Havelaar</b>	Co-Leader, Livestock Disease Management and Food Safety AOI
<b>Dr. Jorge Hernandez</b>	Co-Leader, Livestock Disease Management and Food Safety AOI
<b>Dr. John Vansickle</b>	Co-Leader, Enabling Policies for Livestock AOI
<b>Dr. Greg Kiker</b>	Leader, Future Livestock Systems AOI
<b>Dr. Kathleen Colverson</b>	Co-Leader, Role of Gender in Livestock Systems CCT
<b>Dr. Renata Serra</b>	Co-Leader, Enabling Policies for Livestock/Gender in Livestock Systems CCT
<b>Dr. Sandra Russo</b>	Leader, Human and Institutional Capacity Building CCT
<b>Dr. Rebecca Williams</b>	Research Associate, Human and Institutional Capacity Building CCT
<b>Dr. Sarah McKune</b>	Leader, Human Health and Nutrition CCT
<b>Dr. Sebastian Galindo</b>	Technical Monitoring and Evaluation Supervisor

## Technical and/or Advisory Committee Information

### External Advisory Board (EAB) – as of September 30, 2017

**Table 3: EAB Members, Positions, and Organizations**

Name	Position and Organization
<b>Dr. David Sammons, Chair</b>	Emeritus Dean, University of Florida (UF) International Center
<b>Dr. William Weldon, Vice Chair</b>	Chief Operating Officer of Ascus Biosciences
<b>Dr. Jim Butler</b>	Former Deputy Director General, Food and Agriculture Organization of the United Nations (FAO), now a Private Consultant
<b>Dr. Michael Jacobs</b>	Chief of Party, Mercy Corps Pastoralists' Areas Resilience Improvement through Market Expansion (PRIME) project, Ethiopia
<b>Dr. Iain Wright</b>	Deputy Director, International Livestock Research Institute (ILRI) Integrated Sciences
<b>Dr. Max Rothschild</b>	Distinguished Professor, Department of Animal Science, Iowa State University
<b>Dr. Joyce Turk</b>	Retired, USAID Livestock Research Adviser
<b>Dr. Harinder Makkar</b>	Senior Animal Production Officer, FAO
<b>Dr. Asamoah Larbi</b>	Chief Scientist, Africa Rising/ International Institute of Tropical Agriculture (IITA) Regional representative for West Africa
<b>Dr. Carlos Saviani</b>	Vice President, Food Sustainability at World Wildlife Fund (WWF)
<i>Donor representatives</i>	
<b>Dr. Elaine Grings</b>	Livestock Research Advisor, USAID Bureau for Food Security (Agreement Officer's Representative)
<b>Dr. John Bowman</b>	Senior Agriculture Advisor, USAID Bureau for Food Security, (alternate Agreement Officer's Representative)
<b>Dr. Lindsay Parish</b>	Infectious Disease and Vaccine Advisor, USAID Bureau for Global Health & Bureau for Food Security (Peste des Petits Ruminants [PPR]-Vaccine Associate Award Agreement Officer's Representative)
<b>Ms. Kristen MacNaughtan</b>	Program Officer, Bill & Melinda Gates Foundation (BMGF)

### Internal Advisory Committee (IAC) – as of September 30, 2017

**Table 4: IAC Members, Positions, and Organizations**

Name	Position
<b>Dr. Glenn Morris, Jr.</b>	Director, UF Emerging Pathogen Institute
<b>Dr. Geoffrey Dahl</b>	Chair, UF Department of Animal Sciences
<b>Dr. Sandra Russo</b>	Director, Office for Global Research Engagement, UF International Center
<b>Dr. Pedro Sanchez</b>	Research Professor, Institute for Sustainable Food Systems and Soil and Water Sciences Department, UF

## List of Focal Countries

**Table 5: List of Focal Countries with Regions where research is being implemented**

Region	Countries	District, provinces or regions
Asia	Nepal	Selected districts in the Central, Western, and Mid-Western Regions of Nepal (including: Arghakhanchi, Banke, Bardiya, Dang, Gorkha, Kapilbastu, Palpa, Rasuwa, Surkhet, Chitwan, Nawalparasi, Rupendehi, Baglung, Tanahun, Sarlahi, Morang, Sindhuli, Nuwakot, and Dhading districts)
	Cambodia	Phnom Penh, Battambang, Siem Reap provinces
East Africa	Ethiopia	Amhara, Oromia, Somali, Southern Nations, Nationalities and People's and Tigray regions, and Addis Ababa (chartered city)
	Rwanda	Northern, Southern, Eastern, and Western Provinces, and the Municipality of Kigali
West Africa	Burkina Faso	To be determined (Resiliency zones)
	Niger	To be determined (Resiliency zones)

*Note:* For Burkina Faso and Niger, subawards will be granted in early FY 2018.

# List of Project Partners

## U.S.-Based Partners

- ACIDI/VOCA
- Colorado State University
- Emory University
- Foreign Animal Disease Diagnostic Laboratory, United States Department of Agriculture
- Heifer International
- International Food Policy Research Institute (IFPRI)
- Iowa State University
- Kansas State University
- Mercy Corps
- Montana State University
- RTI International
- TechnoServe
- Texas Tech University
- Tufts University
- University of California – Davis (UC-Davis)
- University of Florida (UF)
- University of Georgia
- University of Tennessee
- Agricultural Research Service - United States Department of Agriculture (USDA)
- Sorghum and Millet Innovation Lab
- Sustainable Intensification Innovation Lab

## Cambodia-Based Partners

- Royal University of Agriculture (RUA)
- University of Battambang
- Centre for Livestock and Agriculture Development (CelAgrid)
- National Animal Health and Production Research Institute (NAHPRI)

## Ethiopia-Based Partners

- Addis Ababa University (AAU)
- Ethiopian Development Research Institute (EDRI)
- Ethiopian Institute of Agricultural Research (EIAR)
- Ethiopia Strategy Support Program
- Hawassa University
- Oda Bultum University
- University of Gondar
- National Animal Health Diagnostic and Investigation Center (NAHDIC)
- Mekelle University
- Yabello Pastoral and Dryland Agriculture Research Centre
- Ethiopian Civil Service University

- Ethiopia Public Health Institute
- Ethiopia Meat and Dairy Industry Development Institute
- Eden-Field Agri-seed Enterprise
- Project Mercy

### **Nepal-Based Partners**

- Nepal Agricultural Research Council (NARC)
- Ministry of Livestock Development
- Himalayan College of Agricultural Science and Technology
- Interdisciplinary Analysts
- National Dairy Development Board

### **Rwanda-Based Partners**

- University of Rwanda (UR)

### **Uganda-Based Partners**

- Makerere University - College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB)
- Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)
- Participatory Epidemiology Network for Uganda (PENU)

### **Kenya-Based Partners** (contracting still ongoing - some will become subawardees)

- Ministry of Agriculture Livestock & Fisheries
- Kenya Agricultural and Livestock Research Organisation (KALRO)
- Kenya Veterinary Vaccines Production Institute (KEVEVAPI)

### **Other International Partners**

- International Livestock Research Institute (ILRI)
- National Veterinary Institute, Sweden
- Swedish University of Agricultural Sciences (SLU)
- Digital Green

## Acronyms

AAU	Addis Ababa University
AFU	Agriculture and Forestry University
AgPOSA	Agriculture Producer Organization Sustainability Assessment
AHT	Animal Health Technicians
ALIPB	Aklilu Lemma Institute of Pathobiology
ASF	Animal-Source Food
AU-IBAR	African Union Inter-African Bureau for Animal Resources
AVCD	Accelerated Value Chain Development
BHEARD	Borlaug Higher Education for Agricultural Research and Development
BMGF	Bill & Melinda Gates Foundation
BSL	Biosafety level
CAHW	Community Animal Health Worker
CDR	Community Disease Reporters
CelAgrid	Centre for Livestock and Agriculture Development
CE SAIN	Center of Excellence on Sustainable Agricultural Intensification and Nutrition
COVAB	College of Veterinary Medicine, Animal Resources and Biosecurity
CRPF	Child Research & Practice Forum
DCT	Dry cow therapy
DL	Distance Learning
DLS	District Livestock Services
DVO	District Veterinary Officers
EAB	External Advisory Board
EDRI	Ethiopian Development Research Institute
EIAR	Ethiopian Institute of Agriculture Research
ELISA	Enzyme-linked immunosorbent assay
ELISE	Improving the evidence and policies for better performing livestock systems in Ethiopia
EMMP	Environmental Management and Mitigation Plan
ESSP	Ethiopia Strategy Support Program
FAO	Food and Agriculture Organization of the United Nations
FCU	Farmer Cooperative Unions
FGD	Focus Group Discussion
FEAST	Feeding System Analysis Tool
FY	Fiscal year
GDP	Gross domestic product
GHP	Good Husbandry Practice
GIS	Graphic Information Systems
GPRA	Global PPR Research Alliance
HH	Household
HICAST	Himalayan College of Agricultural Sciences and Technology
HICD	Human and Institutional Capacity Development
HICES	Household Income Consumption Expenditures Survey
HI – N	Heifer International Nepal
IAC	Internal Advisory Committee
IACUC	Institutional Animal Care and Use Committee
IFAD	International Fund for Agricultural Development



IFPRI	International Food Policy Research Institute
IGAD	Intergovernmental Authority on Development
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
IR	Intermediary Result
IRB	Institutional Review Board
KALRO	Kenya Agricultural and Livestock Research Organisation
KEVEVAPI	Kenya Veterinary Vaccines Production Institute
KLDF	Karamoja Livestock Development Forum
KRSU	Karamoja Resilience Support Unit
KSU	Kansas State University
KUBK	Kisanka Lagi Unnat Biu-Bijan Karyakram
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MCC	Milk Collection Center
ME	Management Entity
MINAGRI	Ministry of Agriculture and Animal Resources
MIP	Minimum intervention package
MoLF	Ministry of Livestock Development and Fisheries
NAHDIC	National Animal Health and Disease Investigation Center
NAHPRI	National Animal Health and Production Research Institute
NARC	Nepal Agricultural Research Council
NGO	Non-governmental organization
PANVAC	Pan African Veterinary Vaccine Centre
PENAPH	Participatory Epidemiology Network for Animal and Public Health
PENU	Participatory Epidemiology Network for Uganda
PI	Principal Investigator
PLW	Pregnant and lactating women
PMP	Project Management Plan
PMTD	Post milking teat dipping
PO	Producer Organization
PPE	Personal protective equipment
PRIME	Pastoralists' Areas Resilience Improvement through Market Expansion
PPR	Peste des Petits Ruminants
PPR VAA	Peste des Petits Ruminants Vaccine Associate Award
PSNP	Productive Safety Net Program
Q	Quarter (of a fiscal year)
RAB	Rwanda Agriculture Board
RCVD	Rwanda Council of Veterinary Doctors
RFA	Request for Applications
RUA	Royal University of Agriculture
RVL	Regional Veterinary Laboratory
SFST	School of Food Science and Technology
SLU	Swedish University of Agricultural Sciences
SMS	Short Message Service
SOPs	Standard Operating Procedures
TCC	Technical Coordination Committee
TWG	Technical Working Group
UBB	University of Battambang

UC-Davis	The University of California at Davis
UF	University of Florida
UNICEF	United Nations Children's Fund
UR	University of Rwanda
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VDAFACA	Ethiopian Veterinary Drug and Feed Administration and Control Authority
WWF	World Wildlife Fund

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## I) Executive Summary

Fiscal year (FY) 2017 was an exciting, activity-filled second year of the Feed the Future Innovation Lab for Livestock Systems. The project further developed and widely communicated the crucial message about the importance of animal-source foods (ASF) in the diets of the vulnerable, particularly through its first Global Nutrition Symposium titled “Nurturing development: Improving human nutrition with animal-source foods,” held in March at the University of Florida. The program continued to work collaboratively with target country stakeholders, holding five Innovation Platform meetings, i.e., annual multi-stakeholder meetings. These meetings developed priorities (in Niger) and presented recently selected projects to the stakeholders (in Ethiopia, Rwanda, Nepal, and Cambodia). Sixteen competitively-selected research projects initiated activities in Ethiopia, Rwanda, Nepal, and Cambodia, and five projects were selected for Burkina Faso and Niger (with contracting and USAID approval expected in early FY 2018). The Innovation Lab also received and started activities of its first Associate Award, the Peste des Petits Ruminants Vaccine Associate Award, and submitted a concept note and full proposal for the Bill & Melinda Gates Foundation (BMGF). Importantly, the research projects for the first cohort of countries (Ethiopia, Rwanda, and Nepal), particularly the one-year Focus projects ending in FY 2018, started to generate significant results. In FY 2017, the research projects had six technologies under research and 10 under field testing, which contributed to accomplishment of the Innovation Lab’s Objective 2, development of technologies and practices that are either productivity-enhancing and environmentally sustainable (Intermediary Result [IR] 2.1) or used for improved surveillance, disease management and food safety (IR 2.2). The Livestock Systems Innovation Lab anticipates that 17 technologies/practices will be made available for transfer in FY 2018. Some activities were delayed due to slow start-up caused by contracting delays and compliance requirements and the complexity of starting multi-partner projects in developing countries. Under the Innovation Lab’s Objective 3, which focuses on enabling policies for livestock, a study in Ethiopia led by B. Minten (principal investigator, [PI]) on the rising cost of nutritious foods, including ASF, by the International Food Policy Research Institute (IFPRI) and its Ethiopian partner, Ethiopia Strategy Support Program (ESSP) resulted in publication of an ESSP working paper, a research paper, and presentations at several fora. Increasing prices of nutritious food was also identified as a constraint for the Productive Safety Net Program (PSNP) to achieve planned nutritional objectives in its fourth phase mid-term review.

Capacity development is integrated across the objectives and intermediary results of the program. During FY 2017, a large number (2,184) of individuals received short-term training (of whom 1,236 were female). The trainings enhanced capacities of producers (1,497 trained; 972 females), people in government (178; 29 females), private sector (39; 7 females) and civil society members (480; 228 females, 365 schoolchildren). Finally, the program continued to emphasize technology transfer and scaling partnerships, through: (1) Innovation Platforms, (2) Development of scaling plans by the research projects, (3) Research partnerships involving private sector, governments, or development projects, a requirement in the Requests for Applications (RFA) issued by the program. Additionally, several projects already made progress in innovation transfer and scaling partnerships. For example, the project led by B. Shrestha from Heifer International, Nepal trained various officials to use a ration balancing tool including Livestock Development Officers from the Department of Livestock Services and technical project staff of a project funded by the International Fund for Agricultural Development (IFAD). Also in Nepal, the project led by C. Mullally of the University of Florida established a Technical Coordination Committee (TCC) with government participation to eventually determine whether its platform will be incorporated into Community Animal Health Worker (CAHW) training across the country. This engagement is an important first step for scaling. In Ethiopia, the project led by W. Smith of the University of California at Davis (UC-Davis) closely collaborated with the government of Ethiopia to ensure that the research serves the government’s efforts to better understand and design effective interventions for controlling or preventing young-stock mortality.

## II) Program Activities and Highlights

FY 2017 was an exciting, activity-filled second year of the Feed the Future Innovation Lab for Livestock Systems. Research priorities were developed for Niger and RFAs published for Cambodia, Burkina Faso, and Niger. The following competitive projects were selected: Three multi-year Reach projects and three one-year Focus projects in Ethiopia, one Reach and two Focus projects each in Rwanda and Cambodia, and one Reach and three Focus projects in Nepal. By the end of FY 2017, two Reach projects for both Burkina Faso and Niger and three Focus projects for Burkina Faso were selected for funding, with contracts expected in early FY 2018. Innovation Platforms in Ethiopia, Rwanda, Nepal, and Cambodia introduced the new projects to and solicited input from the stakeholders on each project's research plans.

Highlights of the FY 2017 research activities are as follows: In Nepal and Rwanda, factors affecting milk quality and safety were investigated, and in Nepal, training to reduce mastitis was conducted. In Ethiopia and Rwanda, nationwide tests were conducted on feed contamination (and milk in Rwanda) with aflatoxin, which compromises animal health and performance and is a human health hazard. Another project in Ethiopia studied changes in animal-source food (ASF) prices over the last decade and built capacities in providing the evidence base for developing enabling policies for livestock production. Two additional projects in Ethiopia focused on animal diseases. One which trained producers and veterinarians in passive disease surveillance, plans to assess the impact of the training on animal health parameters in FY 2018. The second, on young-stock mortality, engaged in discussions with the Ethiopian government and Tufts University on the causes of and solutions to this little understood problem, to determine the methods and locations for piloting mitigation strategies. Agronomic trials were initiated in Ethiopia on forage sorghum varieties with improved yield and digestibility. In Nepal, one project developed software for balancing livestock rations, and another developed software to improve disease surveillance. A third project in Nepal initiated development of a Short Message Service (SMS) platform for goat marketing and a tablet-based platform for a distance learning course to enable women to become community animal health workers. In Cambodia, two species of living fences were planted. All projects took place in close collaboration with focal country partners.

The new, three-year (February 10, 2017-February 9, 2020), \$2.5 million Peste des Petits Ruminants (PPR) Vaccine Associate Award (PPR VAA) initiated work in Uganda through meetings to strategize and plan the research with partners. The project also started business model development and district selection through site assessments, and studied alternatives for a second country, proposing and receiving approval for Kenya, and initiating partnership and strategy discussions there. The project had planned to source the thermostable vaccine from the Botswana Vaccine Institute, but the company decided not to produce the vaccine. Instead, the project discussed procurement from the Kenya Veterinary Vaccines Production Institute (KEVEVAPI), which is interested. Pending USAID approval, production is expected to start in early FY 2018.

Additionally, the Management Entity (1) trained butchers on improved hygiene practices, with a USAID Ethiopia project; (2) conducted a week-long epidemiology training in Rwanda; (3) studied benefits and challenges of Rwanda's "One Cow per Poor Family" program; (4) assessed needs of the Rwandan and Nepalese dairy sectors; (5) conducted a study on factors affecting the competitiveness of the dairy industry in Nepal and Rwanda; and (6) organized its first Global Nutrition Symposium, featuring distinguished researchers, major donors, and development organizations, who highlighted the vital importance of ASF in the diets of the poor. Importantly, in the context of the USAID and Bill & Melinda Gates Foundation (BMGF) collaboration, in quarter 2 (Q2) and Q4, the Management Entity submitted a concept note and full proposal, respectively, to BMGF on quality animal feed supply in Burkina Faso and Ethiopia and on environmental enteric dysfunction in Ethiopia. Another solicited concept note was submitted to the USAID Nigeria Mission, on livestock feed from its target commodities.

### III) Key Accomplishments

In FY 2017, the Feed the Future Innovation Lab for Livestock Systems further developed and widely communicated the crucial message of the importance of animal-source foods in the diets of the vulnerable. The Global Nutrition Symposium held in March in Gainesville, Florida, successfully communicated this message, including by posting the presentations online. Proceedings, video and peer-reviewed manuscript will be published in early FY 2018. Notably, the research projects in the first cohort of countries (Ethiopia, Rwanda, and Nepal), particularly the one-year Focus projects, started to generate significant results. In FY 2017, the Lab had six technologies/practices under research and 10 under field testing. They contributed to accomplishment of the program's Objective 2, which aims to develop two types of technologies/practices, those that are (1) productivity-enhancing, environmentally sustainable, and those that are (2) for improved surveillance, disease management and food safety. Although no technologies/practices were made available for transfer in FY 2017, 17 are anticipated to be transferred in FY 2018. A total of 650 farmers (303 female) in Nepal applied an improved technology or management practice; these farmers reported diseases to women sentries. To address the program's Objective 3, focusing on enabling policies for livestock, an Ethiopia study on the rising cost of nutritious foods including ASF was completed by the Ethiopia Strategy Support Program (ESSP), a collaborative program of the International Food Policy Research Institute (IFPRI) with the Ethiopian Development Research Institute (EDRI). This resulted in publication of an ESSP working paper, a research paper, and several presentations. The increasing prices of nutritious foods was also identified as a constraint for the Productive Safety Net Program (PSNP), to achieve the nutrition objectives in its fourth phase. Realization of more achievements was hampered by slow start-up of subaward projects, due to contracting delays, compliance requirements, and complexity of initiating multi-partner work.

Capacity development is integrated across the program objectives and intermediary results. The program's projects trained a large number (2,184) of individuals (of whom 1,236 were female) during short-term training courses. Training courses that contributed to realization of Objective 2 (technologies and practices), included, among others: 17 trainings for members of women groups on livestock disease recognition and control in Nepal (771 total, 673 women); 9 trainings in Nepal for livestock club members on livestock disease recognition and control (354 total students, 199 girls); 15 trainings on syndromic surveillance for livestock health in Ethiopia (453, 91 women); 15 trainings on good husbandry practices in Nepal (220 total, 144 women); and 8 trainings also in Nepal on dairy animal nutrition using the Feeding Support Tool/Ration Balancing Software (167 total, 89 women). Additional trainings contributed to realization of Objective 3 (policies), such as in Ethiopia on Graphic Information Systems (GIS; 27 trained, 2 women); two trainings also in Ethiopia on feed mycotoxin sampling and testing (25 trained, 1 woman); three trainings on mycotoxin analysis, including the use of enzyme-linked immunosorbent assay [ELISA], in Rwanda (26 total, 7 women); and a training in Nepal for lab staff and students on clinical and sub-clinical mastitis tests, identification of pathogenic microorganisms in milk (8 total, 4 women). The trainings conducted enhanced capacities of producers (1,497 trained; 972 females), people in government (178; 29 females) private sector (39; 7 females), and civil society members (480; 228 females; 365 schoolchildren). Although overall, the majority trained were women (1,236), only a small percentage of the government and private sector trainees were women, presumably due to low number of women in official positions in the ASF sector. Similarly, of the 21 receiving long-term degree-granting training, only three of them were women, indicating room for improvement. Twelve livestock research, education, and extension institutions received institutional capacity development through technical or organizational support; 10 of them were universities. Additionally, 14 organizations (12 producer organizations and two women's groups) received food security-related organizational development assistance. Finally, the program also gave 21 scientific lectures and seminars on technical topics in the target countries, most of which were given at local universities.



## IV) Research Program Overview and Structure

### a) Overview

The Feed the Future Innovation Lab for Livestock Systems aims to improve the nutrition, health, and incomes and livelihoods of the poor by sustainably increasing livestock productivity and marketing, and consumption of ASF. This aim will be achieved by introducing new location-appropriate technologies, by improving management practices, skills, knowledge, capacity and access to and quality of inputs across livestock value chains, and by supporting the development of a policy environment that fosters sustainable intensification and increased profitability of smallholder livestock systems.

The Livestock Systems Innovation Lab's efforts encompass three Cross-Cutting Themes (CCTs): (1) Role of Gender in Livestock Research, (2) Human and Institutional Capacity Development, and (3) Human Health and Nutrition, and the following four Areas of Inquiry (AOIs):

- ASF Production and Marketing, which employs a multidisciplinary, integrated research approach to develop location-appropriate nutrition, lactation, management, and health technologies that will enhance livestock production.
- Livestock Disease Management and Food Safety, which supports and strengthens existing One-Health research and training platforms and projects on livestock disease management and ASF safety. The focus is on improving surveillance for and conducting multidisciplinary research on priority animal and zoonotic pathogens and diseases in order to reduce disease burdens and to increase ASF safety.
- Enabling Policies for Livestock, which facilitates the development and implementation of policies that enhance the production, marketing, and consumption of ASF.
- Future Livestock Systems, which uses mechanistic models and analytical tools to examine how ASF production systems may be affected by emerging challenges or improved by introduced technologies. It particularly examines livestock system responses to proposed interventions in the context of changes in climate, demographics, agriculture, markets, and infrastructure.

Each Cross-Cutting Theme and Area of Inquiry is led by one to two UF faculty members, and in the case of Future Livestock Systems, by ILRI.

The Livestock Systems Innovation Lab awards four types of projects within the framework of its Areas of Inquiry and Cross-cutting Themes:

- Reach projects: Competitive, larger projects with budgets of up to \$1.25 million, for projects lasting for up to four years. These involve multiple partners engaging in research and capacity building and employing an integrated, multidisciplinary approach.
- Focus projects: Competitive, smaller projects with budgets of up to \$150,000, for projects lasting up to one year. These are for proof of concept or research for development bridging studies.
- Catalyst projects: Smaller projects implemented by the Livestock Systems Innovation Lab's Management Entity to address gaps, complement, or leverage efforts in the competitive project portfolio. Selection is through a competition but eligibility is restricted to UF faculty and subawardees.
- Strategic partnership projects: Collaborative efforts with leading research or development institutions that complement the competitive research agenda.

Additionally, the Management Entity conducts Human and Institutional Development (HICD) and Future Livestock Systems research activities, as well as short, focused activities such as assessments and trainings. To date, the program has received one Associate Award, a three-year (2017-2020) Peste des Petits Ruminants

(PPR) Vaccine Associate Award (PPR VAA), which is implemented in Kenya and Uganda by UF and Tufts University with several in-country partners and international collaborators.

## **b) Structure**

The core program consists of competitively and non-competitively funded projects in six countries: Ethiopia, Rwanda, Burkina Faso, Niger, Nepal, and Cambodia. In addition, the PPR VAA project works in Uganda and Kenya. Across its core program, the Livestock Systems Innovation Lab encourages (in the case of Focus and other smaller projects) and requires (Reach projects) that the projects address more than one Area of Inquiry. Therefore, the current projects typically integrate one to two Areas of Inquiry, although some projects involve some efforts in three to four Areas of Inquiry. Several projects also address similar themes, allowing for cross-project linkages. The table below shows the competitively selected projects and the Associate Award for FY 2017 (excluding the projects for Burkina Faso and Niger which are still under contract), and are organized according to their main research theme(s) and country.

Table 6: Funded Project Allocation by Theme and Country

Country	Grant	PI	Lead Institution	Main AOI*	Policy input	Market assessment	Feeds		Production				Disease		
							Feed productivity	Feed quality	Milk quality	Meat production	Milk production	Meat quality	Disease management	Assessment & surv.	
Uganda & Kenya	Associate-PPR	Adegbola Adesogan	University of Florida	LDM&FS										•	
Cambodia	Focus	Michael Tolach	Kansas State University	ASF P&M		•		•		•			•		
Cambodia	Focus	Thomas Gill	University of Tennessee Institute of Agriculture	ASF P&M			•								
Ethiopia	Focus	Brown, Corrie	University of Georgia	LDM&FS											•
Ethiopia	Focus	Armenu, Kebede	Addis Ababa University	LDM&FS					•						
Ethiopia	Focus	van der Merwe, Deon	Kansas State University	ASF P&M	•			•							
Nepal	Focus	Shrestha, Bhola S.	Heifer International	ASF P&M			•				•				
Nepal	Focus	Bowen, Richard	Colorado State University	LDM&FS											•
Nepal	Focus	Sah, Keshav P.	Heifer International	ASF P&M							•				
Rwanda	Focus	Maier, Dirk	Iowa State university	ASF P&M	•			•							
Rwanda	Focus	Ndahetuye, Jean Baptiste	University of Rwanda	ASF P&M					•		•				
Cambodia	Reach	Dela Grace	ILRI	LDM&FS	•								•		
Ethiopia	Reach	Minten, Bart	IFPRI	EP	•	•			•						
Ethiopia	Reach	Vipham, Jessie	Kansas State University	ASF P&M		•		•				•		•	
Ethiopia	Reach	Smith, Woutrina	University of California, Davis	LDM&FS	•										
Nepal	Reach	Mullaly, Conner	University of Florida	ASF P&M	•	•		•			•				
Rwanda	Reach	Ouma, Emily	ILRI	ASF P&M	•				•						
					8	6	6	5	5	3	4	4	4	4	3

\* LDM&FS = Livestock disease management and food safety  
 ASF P&M= ASF production and marketing  
 EP= Enabling policies

## V) Research Project Reports

### a) Ethiopia – Reach and Focus Grant Project Reports

<b>Addressing young-stock mortality in smallholder farms and pastoral herds in Ethiopia</b>	
<b>Reach project, Oct 17, 2016-Oct 16, 2019</b>	
<b>PI Name &amp; Institution:</b> Woutrina Smith, University of California-Davis	<b>Collaborators:</b> Addis Ababa University (AAU), University of Gondar Gondar, National Animal Health Diagnostic and Investigation Center (NAHDIC)
<b>Description:</b> This project assesses the causes of morbidity and mortality of young stock and develops technically sound and context-specific solutions to the constraints identified. It complements recent and ongoing efforts by the Ministry of Livestock Development and Fisheries (MoLF) to reduce young stock mortality in Ethiopia.	
<b>Location:</b> Amhara, Addis Ababa	

#### Achievements

**Develop and evaluate intervention packages at study farms for longitudinal study phase and Participatory Rural Appraisal (PAR):** An important part of the work will focus on diagnostic testing to confirm the causes of youngstock mortality. Additionally, the MoLF and Tufts University developed the initial animal health intervention packages that the MoLF wants to pilot as part of this project. From these packages, the final “minimum intervention package” (MIP) is being prioritized based on consortium field visits that are underway, so that piloting of the highest priority management and health interventions can be done in FY 2018. Recently, the BMGF-funded Supporting Evidence-Based Interventions project joined the national efforts in this area. A current challenge for the intervention phase is reaching a consensus on the intervention type to implement in the MIP, as the broad intervention packages proposed by Tufts/MoLF are too complex to statistically evaluate each individual component of the packages for their effectiveness without confounding by the other components.

**Build human and institutional diagnostic and research capacities:** The project has established Standard Operating Procedures (SOPs) that were approved by USAID for diagnostic testing and procurement of sampling and laboratory supplies that Ethiopian partners need to successfully process and conduct diagnostic assays in-country. The majority of supplies provided are in place for distribution across the partner institutions in Gondar and NAHDIC. Through procurement of supplies and determination of diagnostic assays, capacity building has improved in the partner labs so that they are better equipped to process samples.

#### Capacity Building

Graduate students from AAU, Gondar University, and NAHDIC, along with two laboratory technicians were trained (8 participants, 3 women) at the Aklilu Lemma Institute of Pathobiology (AKLIPB) at AAU and NAHDIC in July. The first day comprised lecture-based training on young ruminant health/disease, highlighting pathogens of interest including sampling methods, appropriate sample storage and diagnostics assays, and finally study design. The second day of training was conducted at NAHDIC on safe animal handling and biological sample collection. The project recruited one PhD student at and three M.S. students for AAU, one M.S. student for Gondar University, and one M.S. student from NAHDIC.

#### Institutional Capacity Development

This was provided to NAHDIC, AAU, and Gondar University through laboratory supplies staff support, staff capacity, and technical support.

#### Lessons Learned

- The need for flexibility in project coordination when multiple partners are involved in a research consortium.

#### Publications and Presentations

1. Chigerwe, M. 2017. Curriculum/Training Material. Bacterial and viral diseases of calves, kids and lambs.
2. Jackson, W. 2017. Curriculum/Training Material. Samples and Diagnostics.
3. Jackson, W. 2017. Curriculum/Training Material. Longitudinal Studies and Disease Incidence.

<b>Linking Cattle Nutrition to Human Nutrition: A Value Chain Approach to Improving the Production, Handling, and Consumption of Animal Source Foods in Ethiopia</b>		<b>Reach project, Oct 17, 2016-Sept 30, 2020</b>
<b>PI Name &amp; Institution:</b> Jessie Vipham and Dustin L. Pendell, Kansas State University	<b>Collaborators:</b> Hawassa University, Oda Bultum University, Ethiopian Institute of Agriculture Research (EIAR), Texas Tech University, Sustainable Intensification Innovation Lab, Sorghum and Millet Innovation Lab, Africa RISING/International Livestock Research Institute, ACIDI/VOCA, Verde Beef, Digital Green, Ethiopia Public Health Institute, Ethiopia Meat and Dairy Industry Development Institute, Eden-Field Agri-seed Enterprise, Project Mercy	
<b>Description:</b> This project aims to create a systems-based research approach that strengthens linkages between improved animal-source food production and consumption practices and human nutrition outcomes in Ethiopia. Efforts span research in forage, ruminant nutrition, meat science, dairy science, food safety, human nutrition, and gender.		
<b>Location:</b> Dire Dawa chartered city, Oromia (Misraq Shewa, Mirab Arsi), Southern Nations, Nationalities, and Peoples (Sidama, Welayita)		

### Achievements

**Forage domain:** Forage trials were initiated, but with EIAR internal funding due to contracting delays. Sorghum collections were characterized for important forage traits (such as dual-purpose (stay-green [grain] and sweet [bio-fuel]) sorghum genotypes for improved yield and quality) and tested for (1) optimum plant population and (2) compatibility and optimal seeding rates with pigeon pea (*Cajanus cajan*) genotypes. At least two promising accessions were identified.

**Ruminant nutrition domain:** Preparations for the trial on dry season feeding/improved protein nutrition of dairy cows were made and Dr. Min gave a silage-making seminar to EIAR researchers. Preparations were made for outreach, extension, and capacity building with partners at Hawassa, ACIDI/VOCA, and ILRI.

**Meat science domain:** A Warner Bratzler Shear force machine was set up at Oda Bultum and Hawassa Universities, and staff were trained to use and maintain it. One PhD and three M.S. students initiated theses on beef quality assessment.

**Dairy science domain:** The IRB approval was received. Community selection was finalized for the baseline consumer survey. This will be conducted in FY 2018 with the stakeholder surveys in dairy product marketing and consumption.

**Food safety domain:** The approach and locations for sampling (Hawassa, Bishoftu, and Addis Ababa) for the baseline data collection for food safety risk determination were decided. An abattoir survey/audit tool is being developed to further understand contamination points. A needs assessment for the Hawassa Municipal abattoir was conducted. Food microbial sampling and analysis training was conducted at Hawassa University for outreach purposes.

**Human nutrition:** Administration of the baseline surveys was delayed but much was accomplished, including development of the survey tool, community identification, data collector training (human nutrition undergraduates from Hawassa), identification of a PhD student, and near completion of the IRB approval process.

**Gender:** Preliminary efforts included organization of a day-long gender training session at Kansas State University (KSU) led by the Management Entity gender Cross-cutting theme Specialist. In addition, a gender lecture was given by Co-PI Murimi at the Jijiga University President's Forum. A major area of focus became program development for young female faculty in Animal Science and Food Science.

### Capacity Building

Short-term training was given to Co-PIs and research technicians on the Warner Bratzler Shear Force Equipment at Melkassa for individuals from Hawassa and Oda Bultum Universities and EIAR (8 trained, including 3 women). Long-term training initiated include one PhD in Human Nutrition in Hawassa, and one PhD in Tropical Animal Production, two M.S. in Food Science and one M.S. in Animal Science. Institutional development focused on laboratory equipment support (Hawassa, Oda Bultum) and assistance with a position interview process in human nutrition in Hawassa.

### Lessons Learned

- Building of collaborative relationships based on trust is extremely important in complex, multi-country initiatives.

### Select Publications and Presentations

1. Min, D. 2017. Scientific Lecture/Seminar. Guidelines for Making High Quality Silage. Melkassa Research Station.
2. Bradford, B. 2017. Scientific Lecture/Seminar. Using in vitro fiber digestibility assays to predict performance of dairy cattle. Hawassa University, Ethiopia.
3. Murimi, M. 2017. Scientific Lecture/Seminar. Empowering women in academia through effective leadership in academics and research: JJU President's Forum. Jijiga University, Ethiopia.
4. Murimi, M. 2017. Conference Presentation. Effective Maternal and Child intervention: Lessons from the Millennium Development Goals and recommendations for the way forward. Presentation at First International Symposium on Nutrition & Health, Jijiga University, Ethiopia.

<b>Improving the evidence and policies for better performing livestock systems in Ethiopia (ELISE)</b>	
<b>Reach project, Oct 17, 2016-Sept 30, 2019</b>	
<b>PI Name &amp; Institution:</b> Bart Minten, International Food Policy Research Institute (IFPRI)	<b>Collaborators:</b> Ethiopian Development Research Institute (EDRI), Ethiopian Institute for Agricultural Research (EIAR), Ethiopia Strategy Support Program (ESSP)
<b>Description:</b> The purpose of this project is to incorporate ASF markets and consumption, in addition to production, as an integral component of research on livestock systems. This will contribute to more informed and evidence-based decision making, which will improve the performance of the Ethiopian livestock sector. The project addresses two broad research themes: (1) Understanding the dairy value chain and (2) Understanding consumption and markets of ASF.	
<b>Location:</b> North Shewa, West Shewa, the Oromia Special Zone Surrounding Finfinne, nationwide	

## Achievements

**Theme 1: Qualitative dairy value chain surveys and design of quantitative survey instruments:** A detailed literature review and a rapid appraisal, including discussions with stakeholders in major dairy producing areas and urban retail markets, were conducted. The results will feed into a questionnaire for the survey that is planned for January 2018.

**Theme 2: Analysis of ASF consumption in Ethiopia:** Secondary data is being analyzed from the national Household Income Consumption Expenditures Survey (HICES), Ethiopian Socio-Economic Survey, and price data from the Central Statistical Agency, and the Ethiopian Livestock Market Information System. A study on the rising cost of nutritious foods including ASF was published/presented as an ESSP working paper, an ESSP research paper, and an ILRI seminar (22 participants). Also, the following papers were presented at the Ethiopian Economic Association annual conference in Addis Ababa (32 participants), chaired by the PI, Bart Minten: (1) ASF consumption patterns and dynamics, (2) Evidence and implications of rising prices, (3) Adoption status of dairy technologies in the Oromia region, and (4) Cattle price trends, quality premiums and associates. Additional presentations on the price studies were done at the National Nutrition Donor Partners Meeting (July 5), Ninth Child Research & Practice Forum (CRPF, Sept 28), and in diverse fora as part of other events such as the Planning Commission meeting (July 28), the UNICEF regional workshop on how to improve complementary feeding (July 21), and the Rural Economic Development and Food Security working group seminar (July 26). The increasing prices of nutritious foods was also identified as a constraint for the Productive Safety Net Program (PSNP) to achieve the planned nutritional objectives in its fourth phase mid-term review.

**Market survey preparation, conduct, and price analysis:** These were delayed due to the security situation in Ethiopia. The survey is now planned for January 2018.

**Additional activities:** A full-time Research Officer was hired by EDRI to work on the analysis of ASF consumption based on the HICES survey. A consultant at Harvard University is further helping with this ASF demand analysis. One researcher from EDRI collaborated on the price analysis paper. Another Research Officer was hired in August to collaborate on the dairy value chain analysis. An EIAR collaborator has been conducting stakeholder interviews and is finalizing his report on a rapid appraisal of the dairy value chain, supplying the city of Addis Ababa. Finally, two national advisory committee policy meetings were held on December 8, 2016 to discuss on-going projects and achievement of the Ethiopia Strategy Support Program including upcoming projects and August 17, 2017 to discuss ongoing research activities and their status. Other discussions were held with e.g., FAO, MoLF, EIAR, EDRI, Pastoralists' Areas Resilience Improvement through Market Expansion (PRIME), Fintrac, Ethiopia Meat and Dairy Industry Development Institute, commercial dairy producers, processors, and the Addis slaughterhouse, to ensure local demand, buy-in and complementarity.

## Capacity Building

Although the value chain training has not yet been conducted, several other initiatives took place. Two Addis Ababa University PhD students are preparing PhD proposals on the economics of the livestock sector and will receive fellowships. Two EDRI research officers work full-time on the project and another one collaborated on the ASF price analysis. One EIAR collaborator started a qualitative assessment of the dairy value chain, and an intern from the University of Pennsylvania worked on the project for seven weeks. A training on "Introduction to Geographic Information Systems (with applications to the livestock sector)" was given to 27 participants, including students and government, non-governmental organizations (NGOs), and private sector at the Ethiopian Economic Association meeting. The same 3-day training was given to 19 EIAR staff in Oct. 2017. Value chain analysis methods were discussed with EIAR and EDRI to build their institutional capacity.

## Lessons Learned

- Partnerships are working well, due to good relationships with and support from EIAR and EDRI, paving the way for a successful second year.

## Select Publications and Presentations

1. Minten, B., Bachewe, F., Hirvonen, K., & Yimer, F. 2017. Research Note. [The rising costs of nutritious foods in Ethiopia](#).
2. Minten, B., Bachewe, F., & Yimer, F. 2017. Conference Presentation. The increasing costs of Animal Source Foods in Ethiopia: Evidence and Implications. Addis Ababa, Ethiopia.

<b>The effect of passive surveillance training on animal health parameters, Northern Ethiopia</b>	
<b>Focus project, Oct 1, 2016-Jan 31, 2018</b>	
<b>PI Name &amp; Institution:</b> Corrie Brown, University of Georgia	<b>Collaborators:</b> Foreign Animal Disease Diagnostic Laboratory and Mekelle University
<b>Description:</b> This project conducts proof-of-concept research on effects of enhancing awareness regarding recognition, reporting, and treatment of public and private-good animal diseases. Activities are conducted in the Tigray region, which has representative but less productive livestock compared to the rest of the country, and therefore has potential for great impact.	
<b>Location:</b> 15 woredas in the Tigray region	

### Achievements

**Collection of aggregate data for baseline:** Data were collected retrospectively over five years from 15 randomly selected woredas in Tigray Region to account for seasonal/climatic changes.

**Training in disease recognition and reporting:** As planned, 15 workshops in the same 15 woredas were conducted March 16-April 6. The Facilitator's Manual created for this project was used to conduct the interactive training. Each workshop was 2 days in length and included both producers and veterinarians (private and public). A total of 346 model producers (77 women) and 107 veterinarians (14 women) were trained on recognition and reporting of transboundary animal diseases, biosecurity, and zoonotic risks. The training was preceded by a day-long training of the six trainers from Mekelle University and government officials by the PI, on delivery of learning using adult education concepts. All attendees received the African Union Inter-African Bureau for Animal Resources (AU-IBAR)-developed training manual for recognition and reporting of transboundary animal diseases. In addition, the veterinarians received a copy of *A Field Manual for Collection of Samples for Diagnosis of Disease*.

**Collection of second six-month data to assess training impact:** The data on disease reporting following the trainings are still being collected for a six-month period (up to November 2017). Currently, Drs. Havas and Netsanet from Mekelle University are conducting the analysis. The results of the study will be shared with Ethiopian stakeholders and will inform possible changes to the surveillance system in place. The FAO-Emergency Center for Transboundary Animal Disease Ethiopia has expressed interest in the approach and may consider continuing similar efforts depending on the results.

### Capacity Building

In addition to the trainings for producers and veterinarians discussed above, capacity building conducted focused on:

- Two-day seminar, given by the PI, in January to 45 fourth and fifth year veterinary students at Mekelle University, on pathogenesis of disease as well as a review of transboundary animal diseases and how to necropsy chickens.
- Train the trainer workshop by the PI (reported above).

### Lessons Learned

- Working with Mekelle University has been smooth and work has proceeded in an efficient manner. Problems with fund transfers were worked out.

### Publications and Presentations

1. Brown, C. 2017. Scientific Lecture/Seminar. Pathology Diagnostic Basics for senior veterinary students. College of Veterinary Medicine, Mekelle University.
2. Brown, C. 2017. Scientific Lecture/Seminar. Diagnosis and Pathogenesis of Transboundary Animal Diseases. College of Veterinary Medicine, Mekelle University.
3. Brown, C. 2017. Scientific Lecture/Seminar. Poultry Disease Overview. College of Veterinary Medicine, Mekelle University. College of Veterinary Medicine, Mekelle University.
4. Brown, C. 2017. Curriculum/Training Material. Adult Learning and Participatory Classroom Dynamics. Manual for Workshop Facilitators.
5. Brown, C. 2017. Poster. Contagious bovine pleuropneumonia. Displayed during 15 project trainings in Tigray region.
6. Brown, C. 2017. Poster. Foot-and-mouth disease. Displayed during 15 project trainings in Tigray region.
7. Brown, C. 2017. Poster. Peste des Petits ruminants. Displayed during 15 project trainings in Tigray region.
8. Brown, C. 2017. Poster. Newcastle disease. Displayed during 15 project trainings in Tigray region.
9. Brown, C. 2017. Poster. Rabies. Displayed during 15 project trainings in Tigray region.
10. Brown, C. 2017. Poster. Lumpy skin disease. Displayed during 15 project trainings in Tigray region.

<b>Safe Feed Safe Food: Mycotoxin Prevalence, Risk Assessment and Mitigation Measures in Ethiopia</b>	
<b>Focus project, Oct 1, 2016-Dec 31, 2017</b>	
<b>PI Name &amp; Institution:</b> Deon van der Merwe, Kansas State University	<b>Collaborators:</b> ACDI/VOCA
<b>Description:</b> This project collaborates with the USDA-funded Feed Enhancement for Ethiopian Development – Phase II & III (FEED II & III) project to assess mycotoxin levels in the Ethiopian feed supply network by sampling feed materials at various farmer cooperative unions. The project will also involve enhancing mycotoxin testing capacity of laboratories and building capacity in preventing mycotoxin contamination of feeds.	
<b>Location:</b> Tigray (North West Tigray; Central Tigray; Eastern Tigray; Southern Tigray; Western Tigray), Amhara (South Gonder; South Wolo; North Shewa; East Gojam; West Gojam; Awi), Oromia (East Wellega; West Shewa; North Shewa; East Shewa; Arsi; Southwest Shewa), and SNNP (Gurage; Hadiya; Kembata Tembaro; Sidama; Wolayita; Gamo Gofa; Silte)	

## Achievements

**Development of the sample design:** As planned, meetings were held with Ethiopian stakeholders such as the principal regulatory authority (Ethiopian Veterinary Drug and Feed Administration and Control Authority, VDFACA), private feed testing laboratories, commercial feed suppliers, and Farmer Cooperative Unions (FCUs). Discussions and direct observations relevant to mycotoxin risks, manufacturing, storage, and distribution shaped the sampling and testing strategy, along with templates from the Kansas State Veterinary Diagnostic Laboratory; these were incorporated in the SOPs for sampling and testing.

**Sample collection in 24 FCUs:** Prior to the data collection planned for FY 2017, classroom and practical training was provided for 25 (1 woman) individuals from ACDI-VOCA, VDFACA, and Mekelle and Bahir Dar Universities. Topics included biology of fungi, signs of fungal infestation in feeds, feed mycotoxin toxicology, mycotoxin management in feeds, and SOPs for feed sample collection and mycotoxin analysis using the CHARM EZ-M system. A total of 1,082 samples were then collected from FCUs in four regions.

**Sample analysis:** As planned, Mekelle University, Bahir Dar University, and VDFACA received CHARM-EZM equipment and training to implement lateral flow testing for mycotoxins in feeds. Test SOPs were reviewed by the Kansas State Veterinary Diagnostic Laboratory QA/QC office. Testing has been initiated but not yet finalized, with 137 tests completed in VDFACA. Delivery of testing supplies to Ethiopia proved challenging and resulted in significant delays, causing deterioration of collected samples, particularly from Tigray. Resampling in three locations is planned for October 2017, coinciding with the new CHARM kit delivery. Samples analyzed include cotton seed cake, maize, soybeans and wheat bran. Initial results indicated that some cotton seed cake samples had high aflatoxin levels but levels of fumonisin, ochratoxin and vomitoxin were low in all tested feeds. For feeds (e.g. noug oil cake) for which no standardized CHARM extraction methods exist, methods for the most similar feeds were used. Their effectiveness will be determined during validation testing with support from CHARM. All results are preliminary until validated at the University of Missouri.

**Strategic and targeted surveys for high-level samples:** Given delays in analysis, these cannot be done during the project period. Note that additional samples were taken due to spoilage of some of the samples.

**Stakeholder meetings to communicate results and discuss its implications:** These will be delayed until December 2017, when the results will be available.

## Capacity Building

Training was conducted on mycotoxin sampling and testing for government lab workers (9), service providers (3), NGO workers (8), and people in academic/research institutions (5) [25 trained, 1 woman].

## Lessons Learned

- Assistance from USAID Mission was crucial to facilitate the importation and delivery of testing supplies.
- Preliminary results support the hypothesis that feed mycotoxin contaminations tend to be localized and sporadic, underscoring need for continued vigilance and the implementation of effective screening methods. Given the limited nature of the project, research should ideally be continued and expanded by local stakeholders.
- Preliminary results indicate that mycotoxin concentrations of concern were associated with feed type. Future sampling strategies should be designed to identify mycotoxin risk in feeds associated with high mycotoxin levels, and investigation efforts should include identification of conditions that enhance risk.

## Publications and Presentations

1. van der Merwe, D. 2017. Curriculum/Training Material. Feed Mycotoxin Prevalence and Mitigation Measures in Ethiopia. Manhattan, Kansas.



<b>Improving handling practices and microbiological safety of milk and milk products in Borana pastoral communities, Ethiopia</b>		<b>Focus project, Nov 1, 2016-May 31, 2018</b>
<b>PI Name &amp; Institution:</b> Kebede Amenu Ejeta, Addis Ababa University and Silvia Alonso, International Livestock Research Institute (ILRI)	<b>Collaborators:</b> University of Tennessee, ILRI, Agricultural Research Service- United States Department of Agriculture, Yabello Pastoral and Dryland Agriculture Research Centre, Ethiopian Civil Service University	
<b>Description:</b> This project aims to improve handling practices of milk and dairy products and thus improve food safety for pastoralists in Borana by (1) improving knowledge, attitudes, and practices of women in the areas of milk consumption and handling and the associated health risks, (2) improving milk storage to maintain its nutritional and hygienic quality.		
<b>Location:</b> Oromia's Borena zone (Yabello, Surupha, Haro Bake, Dubuluk)		

**Achievements**

**Finalization of the project implementation plan:** The project experienced significant delays during FY 2017 due to institutional delays and transfer of key personnel to another university. Consequently, no field or laboratory activities were undertaken. The PI, transferred from Hawassa University, the lead institution at the time the contract was awarded, to Addis Ababa University, necessitating a transfer of the contract. Due to difficulties with international procurement of research supplies at Addis Ababa University, the contract was again transferred to ILRI, with Dr. Amenu continuing as the lead scientist from Addis Ababa University. A second PI, Dr. Silvia Alonso (ILRI), was then added to the project. Due to these delays, the final contract was issued on August 1, 2017.

**Finalization of arrangements for the lab analysis:** Additional delays occurred as the PI sought a certified biosafety level II or III laboratory in the Ethiopian university and national research system that would conduct the planned bacterial isolation of pathogens. Since an adequate lab was not found, the pathogen analysis will now be conducted at a new lab at ILRI. The lab at ILRI does not have biosafety level II certification, but the project will instead seek USAID approval of their SOPs (to be approved first by ILRI) before initiating any lab work.

**Capacity Building**

Two M.S. students recruited to the project are finalizing their thesis proposals and associated protocols for the project, and will be supported by the project in FY 2018.

**Lessons Learned**

- The main lesson learned was that to implement research projects involving human pathogens with partners whose laboratories lack requisite biosafety certifications, their international partners need to review and certify the local laboratories' procedures and practices to ensure compliance with international standards.

## b) Rwanda – Reach and Focus Grant Project Reports

<b>Enhancing the quality and consumption of milk for improved income and nutrition in Rwanda</b>	
<b>Reach project, Jan 1, 2017-Dec 31, 2019</b>	
<b>PI Name &amp; Institution:</b> Emily Ouma, International Livestock Research Institute (ILRI)	<b>Collaborators:</b> RTI International, University of Rwanda, TechnoServe
<b>Description:</b> This project examines the effects of combining nutrition messaging on consumption of high quality milk with the Government of Rwanda's Girinka program and improving the capacity of cooperatives to improve milk marketing. The project (1) Evaluates the impact of nutrition education on ASF consumption and nutrition among children 6-23 months of age and pregnant and lactating women; (2) Assesses and enhances performance and capacity of dairy cooperatives to improve market access for smallholder milk producers; and (3) Evaluates the costs and benefits of supplying milk that meets the Seal of Quality standards.	
<b>Location:</b> Eastern (Bugesera, Gatsibo, Kayanza, Nyagatare), Northern (Gicumbi, Musanze, Rulindo), Southern (Kamonyi, Huye, Nyanza), and Western (Nyabihu, Rubavu) provinces	

### Achievements

**Adjustments to the project design and project launch:** During the January 2017 Rwanda Innovation Platform meeting, the stakeholders proposed adjustments to the design of the project that were approved by USAID in September 2017. They included: (1) Add a third study arm as a no-intervention control, (2) Increase sample size for sufficient statistical power to measure changes in dietary diversity, (3) Use a longitudinal design, (4) Focus on children 12-18 months at baseline, and (5) Randomize at the cell level. The project inception workshop was held on March 7, 2017 and brought together 31 participants (9 women) from the government, nongovernmental, and research organizations, as well as other relevant dairy projects, allowing for individual meetings and meetings with potential bidders on the nutrition intervention activity.

**Baseline data collection:** The baseline data collection planned for FY 2017 has been delayed until November 2017. The survey questionnaire and consent forms were drafted, revised to incorporate feedback and they are currently being configured into the Open Data Kit for implementation using tablets. Translation into Kinyarwanda and recruitment of enumerators are ongoing.

**Project site selection, household identification and preparations for the nutrition intervention:** The March 2017 team meeting developed criteria for district selection, including < 5 stunting prevalence, moderate-severe food insecurity, poverty level, milk production level, presence of milk collection centers, and lack of existing nutrition activities. The last criteria proved problematic as nutrition programs in Rwanda are prevalent. The baseline survey has been delayed, but preparations included development and posting of a Request for Applications (RFA) to identify an organization for its design and implementation. Eight applications have been reviewed and selection of the awardee is ongoing.

**Adaptation, pre-testing and implementation of the Producer Organization (PO) Sustainability Assessment tool:** As planned, Technoserve developed a harmonized tool called Agriculture Producer Organization Sustainability Assessment (AgPOSA), which combines elements of the Technoserve-ILRI original tool and the Land O'Lakes Cooperative Assessment Performance tool. Feedback from partners on gender and indicator weighting was used to improve the tool. AgPOSA involves sustainability dimensions and determines PO capacity gaps and develops action plans to close them. Though implementation of this tool was delayed, selection criteria were developed, 30 POs were selected, and the project was introduced to the management and PO Board of Directors. Enumerators were selected and trained to use AgPOSA for data collection. Finally, the sustainability assessment was conducted for selected POs in August-September.

**Evaluate costs and benefits of the Seal of Quality:** During FY 2017, the protocols for these components were developed by ILRI project staff in collaboration with the University of Rwanda.

**Preparations of the Seal of Quality survey:** The survey was planned for FY 2017 and significant preparations were made. The survey instrument on the cost structure of smallholder dairy farmers was developed and will be implemented in Quarter 1 of 2018, after translation into Kinyarwanda and field testing.

### Capacity Building

The project implemented AgPOSA tool training for the enumerators (7 trained, 2 women), and one M.S. student started on his agribusiness program. A lecture was given to Faculty of Food Science, University of Rwanda staff and students on occurrence, treatment and prevention of global child under-nutrition.

### Lessons Learned

- Partnerships with policy level partners is very important to ensure smooth project operations. Sufficient time should be built into similar projects for approval by all pertinent government authorities.

### Publications and Presentations

1. Flax, V. 2017. Scientific Lecture/Seminar. Global child undernutrition and interventions to treat or prevent it. UR.
2. Ouma, E. A. & Kawuma, B. 2017. Report. Enhancing milk quality and consumption for improved income and nutrition in Rwanda – Project inception workshop report.
3. Kawuma, B. 2017. Brochure. [Enhancing Milk Quality and Consumption for Improved Income and Nutrition in Rwanda](#).

<b>Milk production practices, udder health and their impact on milk quality, safety and processability in Rwanda</b> <b>Focus project, Oct 17, 2016-March 31, 2018</b>	
<b>PI Name &amp; Institution:</b> Jean Baptiste Ndahetuye, University of Rwanda	<b>Collaborators:</b> Swedish University of Agricultural Sciences (SLU), National Veterinary Institute (of Sweden)
<b>Description:</b> The objective of the current project is to develop best practices that enhance dairy cow udder health and milk quality in Rwanda. The project investigates factors that affect dairy cow udder health and how the udder health and handling of milk from farms to milk collection centers, affects the quality of milk.	
<b>Location:</b> Eastern (Iburasirazuba), Northern (Aamajyaruguru), Western (Iburengerazuba), and Southern (Amajyepfo) provinces	

### Achievements

**Screening for and survey on sub-clinical mastitis:** The project purchased milk sampling and sample analysis materials. A total of 560 cows from 407 farmers from eight Milk Collection Centers (MCCs; two from each of the four provinces) were screened for sub-clinical mastitis. Farmers became acquainted with their cows' status through participation in the screening tests. Questionnaires administered at cow, herd, and MCC levels on risk factors that may lead to mastitis or low milk quality, further improved farmer knowledge of mastitis. The milk samples were analyzed as received for Somatic Cell Count, Total count, Total Coliform, and *Escherichia coli*. The data are currently being analyzed.

**Development of best practices for udder health and milk production, and trainings:** The project collated key training documents, accumulated important contacts and devised ways to structure the training during the screening phase. The basic content of the training to reduce milk rejection and mastitis has been determined and region-specific training materials are under development. The project team acquired valuable insights about engaging farmers from the different stakeholders that were involved. Trainings are planned for FY 2018.

### Capacity Building

The project PI is a PhD candidate at the Swedish Agricultural University in Animal Health. Also, two M.S. students (1 woman) at the University of Rwanda's Animal Production department were supported by and participated in the project.

### Lessons Learned

- Incorporating monitoring and evaluation activities in research activities from the project outset helps track progress.
- Collection of baseline data on smallholder dairy farming improves project design and ability to track improvements.
- Partnerships with organizations directly in contact with research beneficiaries, such as MCCs, help the project understand the problems and how to address them.

### Publications and Presentations

1. Ndahetuye, J., Persson, Y., Artursson, K., Bage, R., & Nyman, A. 2017. Scientific Lecture/Seminar. Udder health and milk quality. University of Rwanda.
2. Ndahetuye, J., Bage, R., Nyman, A., Persson, Y., Artursson, K., Diangwani, J., & Shyaka, A. 2017. Brochure. [Milk Production Practices, Milk Quality, Safety and Processability in Rwanda](#).
3. Ndahetuye, J. 2017. Newsletter article. [Bovine mastitis and milk quality in Rwanda](#). IDF Animal Health Report, Issue No 11.

<b>Assessment and Mitigation of Aflatoxin and Fumonisin Contamination in Animal Feeds in Rwanda</b> Focus project, Dec 1, 2016-Mar 31, 2018	
<b>PI Name &amp; Institution:</b> Dirk Maier, Iowa State University	<b>Collaborators:</b> University of Rwanda (UR)
<b>Description:</b> The objective is to assess and mitigate the prevalence of aflatoxins and fumonisins in animal feeds in Rwanda and to raise awareness among professionals and policy makers in order to better protect consumer health and increase export opportunities.	
<b>Location:</b> Eastern (Bugesera, Kirehe, Ngoma, Rwamagana, Gasaba), Southern (Gisagara, Huye, Kamonyi, Muhanga, Nyamagabe, Nyanza, Nyaruguru, Ruhango), and Western (Rusizi) provinces and Kigali (Gasabo, Kicukiro)	

## Achievements

**Setting up the UR laboratory** As planned, Kizito Nishimwe spent Fall 2016 and Spring 2017, at Iowa State University, acquiring skills on mycotoxin analysis and sampling, which proved useful for sample collection in Rwanda and setting up the lab at UR. Lab space provided by the School of Food Science and Technology (SFST) was furnished with equipment, materials, and supplies needed for analysis of aflatoxin and fumonisin in feeds and aflatoxin M1 analysis in milk. A laboratory manual and SOPs for grinding, extracting, storing, and analyzing samples was developed and is being used.

**Feed sampling and quantification of mycotoxins:** Feed sampling took place in 30 districts at dairy and poultry farms, feed processors, and vendors using contact information from the Rwanda Council of Veterinary Doctors and 30 District Veterinary Officers. Five of six rounds of samples have been collected and analyzed for aflatoxin and fumonisins (615 per round) and the data is being collated and analyzed. A total of 172 milk samples collected from dairy farms for aflatoxin M1 analysis by the UR-led focus grant will be analyzed after completion of the sixth round of sample collection in October 2017.

**Mycotoxin analysis at UR School of Food Science and Technology (SFST):** This activity has been delayed due to the new organizational structure being implemented by UR, which required moving the SFST laboratory from the Nyarugenge to the Busogo campus. The Applied Biology lab on the Nyarugenge campus has agreed to host the lab for the remaining project activities.

**Training SFST faculty, staff, and students in mycotoxin analysis:** Students (2 female), the UR project collaborators, and a lab technician (female) were trained in both lab safety and aflatoxin and fumonisin extraction from feeds and data analysis. Additionally, a third training involving hands-on practice on ELISA techniques and their application for mycotoxin analysis was held for SFST students and staff on August 14, 2017. Furthermore, the lab technician received a 1-week training from the BecA-ILRI Hub collaborator on lab management and equipment operations in September 2017 in Kampala, Uganda.

**Increasing awareness among stakeholders about the presence and prevention of aflatoxin and fumonisin:** Teaching materials for training farmers including a poster and two-sided rack cards explaining dangers of mycotoxins and how to prevent mycotoxin contamination, were developed in English and translated into Kinyarwanda. These materials will be used to train farmers during the last round of sample collection.

**Review and analyze policies and regulation regarding mycotoxins:** Project team members reviewed RS: 100:2017 from Rwanda Standards Board, which documents permissible levels for total aflatoxins and aflatoxin B1 in cattle feed supplements. The maximum levels for total aflatoxins are 100 µg/kg and 300 µg/kg for calves and other cattle, and those for aflatoxin B1 are 5 µg/kg, 10 µg/kg and 50 µg/kg for dairy cattle, calves and others cattle, respectively. Standards for other mycotoxins are needed as is increased awareness about the dangers of mycotoxins because over 90% of the project participants had no knowledge of mycotoxins.

## Capacity Building

Two UR collaborators (Mr. Ayabagabo and Mr. Habimana) were selected by the USAID-funded Borlaug Higher Education for Agricultural Research and Development (BHEARD) program to pursue their PhDs studies in Kenya beginning in September 2017. The entire team was trained by Mr. Nishimwe while the lab was being set up. A seminar was presented in January 2017 to about 30 faculty and students at SFST on two separate topics: (1) *Food security through Post Harvest Loss Reduction and Mycotoxin Mitigation* presented by Dr. Dirk Maier and (2) *Mycotoxin Contamination in Food and Animal Feeds: Challenges and Potential Mitigation Approaches from Eastern and Central Africa* presented by Dr. Samuel Mutiga. Short term trainings conducted include (1) Training conducted with students and the lab technician on sample preparation and analysis (7 participants, 3 women) and (2) A training ELISA-based mycotoxin analysis (26 participants including 7 women).

## Lessons Learned

- The project has allowed excellent collaboration between three different institutions, however, one year is too short to achieve the objective of testing, demonstrating, and transferring mycotoxin mitigation strategies to stakeholders.

## Select Publications and Presentations

1. Maier, D. E. 2017. Scientific Lecture/Seminar. Food Security through Postharvest Loss Reduction and Mycotoxin Mitigation. University of Rwanda, Kigali, Rwanda.
2. Maier, D. E., Bowers, E. L., & Kizito, N. 2017. Poster. [Increase Animal Performance by Reducing Afl. Contamination.](#)
3. Maier, D. E., Bowers, E. L., & Kizito, N. 2017. Curriculum/Training Material. Mycotoxin Awareness Rack Card.

## c) Nepal – Reach and Focus Grant Project Reports

<b>Innovations for Smallholder Female Livestock Growers in Nepal</b>		<b>Reach project, Oct 17, 2016-Sep 30, 2020</b>
<b>PI Name &amp; Institution:</b> Conner Mullally, University of Florida	<b>Collaborators:</b> Montana State University, University of Georgia, Nepal Agricultural Research Council, Interdisciplinary Analysts, and Heifer International Nepal (HI-N)	
<b>Description:</b> This project aims to design, implement, and rigorously evaluate three innovative and potentially transformative interventions to improve goat value chain functionality in rural Nepal. These include innovations in animal feeding, strengthening of animal health services through community animal health workers, and improving the efficiency and sustainability of cooperatives.		
<b>Location:</b> Eastern region (Koshi), Central region (Narayani, Janakpur, Bagmati, Narayani), Western region (Gandaki, Dhaulagiri, Lumbini, Gandaki), Mid-western region (Rapti, Lumbini, Bheri)		

### Achievements

**Review HI-N monitoring data, construct baseline data set:** For its program areas, Heifer has comprehensive data on the primary agricultural activities by each cooperative – this data was used to identify the 120 cooperatives included in the intervention. Heifer also has data on annual revenue from goat sales, which will be used to stratify the list of cooperatives to the smartphone app treatment or control groups. In January 2018, a household survey will be carried out to collect additional data in the treatment and control groups. In addition, a phone survey of women eligible to work as Community Animal Health Workers (CAHWs) will be conducted in FY 2018 to collect baseline data on individuals for the distance learning study.

**Focus groups and semi-structured interviews to ensure appropriateness of the proposed interventions:** Five focus group discussions and 11 key informant interviews were carried out in November and December of 2016. The Focus Group Discussions (FGDs) and key informant interviews were conducted in the Nawalparasi and Banke districts of Nepal, and participants included cooperative members and leaders, goat traders, veterinary technicians, and CAHW trainers. The results indicate that major impediments on selling higher volumes of animals through cooperatives are the slow transaction speed through cooperatives and long distances between group members. The smartphone app should alleviate these constraints. For the barriers to training for CAHW candidates, it proved difficult to get respondents to focus on women who had *not* succeeded in training as CAHWs. However, respondents indicated that there is a very high attrition rate for women training as CAHWs, that the curriculum is outdated and that refresher trainings are needed. The distance learning platform should improve attrition rates by reducing the burden of being away from home. It will also allow for distributing updated instructional materials and administer refresher trainings.

**Initial stakeholder meeting:** Rather than one initial meeting, several meetings were conducted to gain stakeholder buy-in. First, the team met during the Innovation Platform meeting in December 2016. During that same week, the ME, the project PI, and Heifer International representatives met with the Directorate of Livestock Services (DLS) to discuss the project. Subsequently, Heifer met with the DLS. As a result, two groups were formed, each with DLS representation: a Technical Working Group (TWG) and a Technical Coordination Committee (TCC), each with key role (see below for details).

**Field test improved feed and fodder:** Two research sites were selected and all experimental materials were acquired (fodder varieties and goats). However, delay in procurement postponed activities to FY 2018. This delay does not represent a risk to the completion of these activities within the timeframe of the grant.

**Design of SMS platforms:** Some progress was made in this activity planned for FY 2017. The U.S.-based research team wrote a document laying out the details of the SMS app, e.g. flow of data through the network and differences in app functionality for cooperative officers and leaders of self-help groups. Heifer and the U.S.-based team wrote the Terms of Reference for a consultancy that would result in creation of the SMS app. After receiving five proposals, the team selected a Nepali firm called Pathway for the development of the app. A contract is expected in Q1, FY 2018.

**Design of distance learning platforms:** Heifer and the DLS formed a TWG and a TCC to shepherd the distance learning (DL) platform through the Government of Nepal approval process. The TWG works on the nuts and bolts by, e.g. evaluating consultants, interacting with CAHW training centers. The TCC is the higher-level body that will decide whether the DL platform will be incorporated into training for CAHWs in Nepal. The project also selected one veterinarian to provide scientific guidance on platform development and narrowed the list of candidates for platform development to two Nepali firms. A final decision is expected early FY 2018.

**Pilot SMS and distance learning platforms and obtain feedback through focus groups:** These are delayed to FY 2018.

### Capacity Building

No short-term trainings were conducted. Three PhD students were enrolled at Agriculture and Forestry University of Nepal, in Animal Breeding, Pasture /Fodder and Animal Nutrition. Each of these students will provide research support to NARC.

### Lessons Learned

- Sufficient time needs to be included in work plans for NARC internal approvals for research projects.
- Email communication is not always effective; use of Skype and Slack have facilitated communication.

<b>Empowerment of Village Women for Detection and Control of Livestock Diseases in Nepal</b> <b>Focus project, Oct 1, 2016-Jan 31, 2018</b>	
<b>PI Name &amp; Institution:</b> Richard Bowen, Colorado State University	<b>Collaborators:</b> Nepal Agricultural Research Council, Ministry of Livestock Development, Himalayan College of Agricultural Sciences and Technology
<b>Description:</b> The goal of this project is to test a comprehensive program for livestock disease reporting and control in Nepal. The project establishes a rapid reporting and response network for livestock diseases based on women from the communities. It also develops or enhances the support structures necessary for success of the rapid reporting and response networks and prepares the next generation of producers through school-based livestock clubs for youth.	
<b>Location:</b> Central region (Nuwakot, Dhading)	

### Achievements

**Recruiting and training of women “sentries”:** After consulting community leaders, the project selected five women in Dhading district and six in Nuwakot district; eight of whom live in remote areas very poorly served by the District Livestock Services (DLS). The women sentries were trained in disease recognition and reporting, and provided with Android smartphones with apps for disease reporting and animal enumeration. The app was also demonstrated to the DLS officials in Dhading and Nuwakot. From January 4 to September 30, 2017, 816 disease reports were uploaded by sentries to a database on almost a daily basis and monitored by the PI who notified DLS veterinary officers when follow up was required. Reporting and follow up data are still being analyzed. The project struggled to elicit substantive engagement with DLS veterinary officials and therefore established a Livestock Hotline Nepal – a Facebook page dedicated to providing advice to vets, paravets and farmers (<https://www.facebook.com/groups/287636611704687/>) in July 2017. This Facebook group now has 127 members, including several Nepali and US veterinarians.

**Training of school children in recognition and control of livestock diseases:** After describing the project goals to principals and teachers in 9 schools, the proposed training was enthusiastically welcomed and added to the curriculum. The project then visited the schools (5 in Dhading and 4 in Nuwakot) in the two districts and trained 354 students (199 girls) in basic concepts in disease recognition, reporting and management. The project has also developed a census form for tracking the occurrence of livestock disease (morbidity and mortality) in the students’ families.

### Capacity Building

Beyond the training of the sentries and the schoolchildren, large numbers of farmers were trained in livestock disease recognition and reporting via the sentries. Training was provided to a total of 1,148 individuals (870 women) which included 755 farmers (664 women), 376 farmer group representatives (200 women), and 17 government officials (6 women).

### Lessons Learned

- There is an almost complete lack of diagnostic veterinary medicine for Nepali farmers due to limited resources, lack of veterinary knowledge among paravets, poor road networks, and lack of human power. Farmers do not consider reporting diseases beneficial, as it elicits no response, which hinders effectiveness of the potentially useful innovative disease reporting system introduced.
- Additional training for women is needed to differentiate minor from more serious diseases.
- Due to sociocultural factors, Nepali farmers do not euthanize sick and even suffering animals, which causes considerable productivity losses.
- Necropsy training would be valuable for veterinary service providers (mostly paravets) as it would improve diagnoses. However, ongoing support by experienced personnel is needed as the paravets may lack the technical knowledge to visually diagnose diseases and to take the correct samples for laboratory diagnosis.

### Publications and Presentations

1. Shrestha, R., Shakya, R., & Bajracharya, S. Curriculum/Training Material. Livestock Disease Recognition and Control.
2. Shakya, R. 2017. Video. Empowering of Village Women. <https://youtu.be/bawDDxl-cG4>.

<b>Improving Dairy Animal Productivity and Income of Dairy Farmers through Effective Control of Mastitis Disease</b> Focus project, Oct 1, 2016-Feb 2, 2018	
<b>PI Name &amp; Institution:</b> Keshav Shah, Heifer International Nepal	<b>Collaborators:</b> Himalayan College of Agricultural Sciences and Technology (HICAST)
<b>Description:</b> The objective is to increase the productivity of dairy animals and thus the income of smallholder dairy farmers, through recommending appropriate strategies to control mastitis. The project focuses on capacity building in good husbandry practices (GHP), including post milking teat dipping (PMTD) technology and dry cow therapy (DCT).	
<b>Location:</b> Midwestern region (Dang, Surkhet, Bardiya)	

### Achievements

**Baseline survey on major gaps in GHP adoption and prevalence of sub-clinical mastitis:** The baseline survey on GHP gap identification was conducted in Q2 by eight final year HICAST veterinary students. The activity took longer than planned, due to long distances between households and small herd sizes. The baseline survey on mastitis prevalence was conducted in Q3 by four project technicians who conducted the California Mastitis Test on milk samples twice a day from each quarter in FY 2017 of dairy animals at 200 farms. The data indicated high prevalence of mastitis, up to 80%.

**GHP manual and field trainings:** A Nepali GHP manual, developed in response to baseline survey findings, was published in Q3. Front line extension/animal health workers were first trained on GHP, and they then trained the farmers. Additional trainings focused on milk sample collection, hygiene, and sanitation.

**Analysis of milk conductivity readings and somatic cell counts in dairy animals:** Milk samples from four dairy cooperatives (one from each project area) were subjected to conductivity and somatic cell count tests every 25 days. They were also supported with Milk checker to conduct milk conductivity tests. Results will be analyzed in Q1 FY 2018, but cooperatives are already advising members about their milk mastitis levels based on the conductivity readings.

**Identification of extension approaches/tools for mastitis control:** Tests of the efficacy of PMTD and DCT are ongoing. These involved development and use of selection criteria for inclusion of farmers and dairy animals and setting up randomized control trials with (1) animals positive or (2) negative for sub-clinical mastitis, and with (3) animals that are one month prepartum. The results will be analyzed in Q1 FY 2018, and farmer exchange visits will be organized then.

**Identification of the most effective antibiotics for clinical mastitis:** This activity was delayed due to the lack of BSL 2 labs and the time it took to get approval to conduct the analysis using approved procedures. Procurement of required lab equipment/reagents was delayed in order to fulfil USAID compliance requirements, which delayed further the lab work. Trainings for animal health workers and technicians, regional veterinary lab staff and HICAST students on clinical and sub-clinical mastitis tests, milk microorganism identification, and antibiotic sensitivity tests have been completed.

**Awareness creation on clinical mastitis and haphazard use of antibiotics:** These activities are now planned for FY 2018.

### Capacity Building

Several short-term trainings were conducted: (1) Introduction of GHP, major gaps in GHP adoption by dairy farmers, associated constraints, and motivational factors for adoption (6 trained, 0 women); (2) Skills training for extension workers on appropriate techniques for quality milk sampling for the California Mastitis Test and milk microbiology analysis (6 trained, 0 women); (3) Theoretical and hands-on training for laboratory staff and HICAST students on clinical and sub-clinical mastitis tests, milk culture, bacteria isolation, identification and antibiotic sensitivity test (15 trained, 4 women); (4) GHP training to dairy farmers (220 trained, 152 women). Also, capacity support was given to: (1) Regional Veterinary Laboratory, Surkhet, laboratory staff on bacterial isolation, identification and the antibiotic sensitivity test; laboratory equipment and reagents for various milk analyses tests were supplied; (2) HICAST students on baseline survey method and conducting milk microbiological analyses, (3) dairy co-operatives on milk conductivity tests, and establishing mechanisms to get feedback to farmers on sub-clinical mastitis, (4) women's groups on importance of GHP, PMTD and DCT.

### Lessons Learned

- One year is too short for all the planned activities.
- Heifer's previous work at project sites established social capital, which can improve adoption and scaling up, but meeting expectations of the farmers to receive participation incentives is difficult.
- The short-term nature of the activities makes it difficult to attract good quality staff.
- This research project provides opportunities for students and professionals to learn directly by working with farmers.

### Publications and Presentations

1. Sah, D. P. 2017. Curriculum/Training Material. Good Husbandry Practices manual and tailor-made training course development. Published in Nepali.

<b>Development of feeding support tool for enhancing dairy animal productivity for improved livelihood of smallholder dairy farmers in Nepal</b>	
<b>Focus project, Oct 1, 2016-Feb 2, 2018</b>	
<b>PI Name &amp; Institution:</b> Bhola Shrestha, Heifer International Nepal	<b>Collaborators:</b> Nepal Agricultural Research Council (NARC), National Dairy Development Board
<b>Description:</b> The overall goal of this project is to increase household incomes and create improved livelihoods for smallholder dairy farmers through improvement of dairy animal productivity particularly through feeding management improvement. The project will (1) analyze dairy animal feeding practices and identify and recommend major areas for improvement; (2) Utilize software for balancing feed rations with available low-cost ingredients; and (3) Build capacity of frontline livestock extension workers and smallholder dairy farmers, especially women, in dairy animal feeding management.	
<b>Location:</b> Western region (Palpa, Arghakhanchi, Kapilabastu)	

### Achievements

**Existing dairy animal feeding system assessment:** As planned, the ILRI Feeding System Analysis Tool (FEAST) was used to assess the existing dairy animal feeding system. Six FGDs and Household Surveys were conducted at six sites in the three project districts. The FGD data are under review and the household survey data were analyzed by a B.S. student from Tribhuvan University as part of his thesis. Husbandry practices to address the gaps were included in a booklet on good husbandry practices; this is under review. Gender analysis of the dairy system is ongoing.

**Feed resources cataloguing and nutrient analysis:** As planned, the published nutrient content values of common dairy animal feeding resources from various sources were compiled in an Excel database. To increase its utility, it will be posted on the website of NARC's Animal Nutrition Division, a collaborating partner in this project. Diverse feed resources (concentrates from different sources, crop byproducts, crop residues, cultivated and local grasses, fodder trees, vegetable waste) found in six project sites were collected and analyzed for chemical composition at NARC and added to the database. Samples collected from the same sites during the rainy season are being analyzed. The high workload of the NARC Animal Nutrition Laboratory has delayed the feed sample analysis.

**Customization of the FAO ration-balancing software:** The nutritive value and price of locally available feeding resources have been entered into the FAO software. An M.S. (Animal Nutrition) student from Agriculture and Forestry University is evaluating the software and using it to conduct feeding trials at all project locations and farms of NARC and DLS. Use of the adapted software will be scaled up through workshops in FY 2018.

**Development of Excel-based linear programming least-cost ration balancing software for dairy animals:** To overcome shortfalls of the FAO ration balancing software (e.g., inability to accurately estimate nutrient requirements of buffaloes with high milk fat content), the project also developed similar software (Linear Program using Solver in Excel) that overcomes these shortfalls and is being used for buffalo feeding trials. This had not been anticipated in the FY 2017 work plan.

### Capacity Building

Short-term capacity building included: (1) One three-day dairy animal feeding management training for technicians from governmental and non-governmental organizations (18 trained, 8 women), (2) Eight trainings on dairy animal feeding and health management training for producers (167 trained, 89 women), (3) One training of technicians and staff from cooperatives on use of ration balancing software (20 trained, 2 women) and (4) A three-day exchange visit for 30 farmers from the project sites to visit the Mastitis control project site in Bardiya district (cf. project PI, Dr. Shah). Long-term capacity building included one M.S. student in Animal Nutrition and one B.S. student in Agriculture, both of whom are male. The project also supported institutions in the following ways: (1) provision of supplies for feed analysis to the Animal Nutrition Division, NARC and (2) provision of tablets/laptops loaded with FEAST and nutrient content analysis software to six Milk Producers Cooperatives/Women Farmers' Cooperatives and the District Livestock Service Office, Arghakhanchi.

### Lessons Learned

- Research trials in farmers' fields are difficult to implement with unforeseen circumstances often hampering progress.

### Publications and Presentations

1. Paudel, T., Shrestha, B. S., & Raj Pokharel, B. 2017. Report. Dairy Animal Feeding System.
2. Ghimire, R. & Shrestha, B. S. 2017. Curriculum/Training Material. Feeding and Health Management of Dairy Animals. Unpublished, in Nepali.



## d) Cambodia – Reach and Focus Grant Project Reports<sup>1</sup>

<b>Safe Food, Fair Food for Cambodia</b>		<b>Reach project, Jul 24, 2017 - Jul 23, 2020</b>
<b>PI Name &amp; Institution:</b> Delia Grace, ILRI	<b>Collaborators:</b> National Animal Health and Production Research Institute (NAHPRI), CelAgrid, Emory University	
<b>Description:</b> This project is assessing the multiple burdens of foodborne diseases associated with key Animal-Source Food (ASF) value chains in Cambodia, in order to adapt and evaluate a market-based approach to improving food safety. The overall aim of the project is to reduce the burden of foodborne disease in informal, emerging formal, and niche markets. The project will target small and medium scale producers following a holistic, One-Health approach.		
<b>Location:</b> Siem Reap province and Phnom Penh		

### Achievements

**Development of risk profiles for food safety problems in ASF value chains:** The project developed templates for risk profiles and identified the top 10 hazards for “countries comparable to Cambodia” in the Foodborne Disease Burden Epidemiology Reference Group global assessment for Food-borne Diseases. The project also initiated a systematic literature review, identifying 99 papers and starting data extraction. Additionally, a Terms of Reference for grey literature review was started. A prototype food safety system performance assessment tool which has been developed in other studies will be used for Cambodia.

**Multi-hazard survey and qualitative risk assessment of priority hazards in two ASF value chains:** Four partners have been identified with capacity for hazard testing: (1) NAPHRI, (2) Institute Pasteur, (3) RUA, and (4) National Institute for Public Health. Laboratory assessments have been conducted and diagnostics available for priority hazards have been identified. The qualitative risk assessment will be based on the survey and other instruments, and will be done later.

**Conduct of cost of illness assessment:** The person identified to lead this effort (a medical doctor, university lecturer, and South East Asia One Health University Network fellow) has developed a draft work plan on the basis of a previous study conducted for the PigRisk project in Vietnam. Compliance needs are being assessed.

**Development of a theory of change:** The key stakeholders for this effort are the National Food Safety Task Force or working group, which is in process of being convened. The ongoing evidence gathering and capacity building in risk-based prioritization (scheduled for Q1 2018) will contribute to this effort.

**Gender integration:** The gender scientist will review the final version of the Cost of Illness protocol, systematic literature review, and grey literature protocols to ensure they are gender informed/sensitive.

### Capacity Building

A SEAHOHUN Fellowship Award was granted to Dr. Hardisman Dasman, Head of Master of Public Health Program, Faculty of Medicine of Andalas University, Indonesia, allowing him a four-month internship with ILRI, Hanoi from Sept 2017 onwards. He will be involved in the cost of illness study. Capacity support to institutions was provided to RUA, CelAgrid, and NAPHRI, in scoping mission to assess capacity and needs. Additionally, a seminar was conducted on concepts of OneHealth, food safety in informal markets, hazard- versus risk-based approaches to 20 VPH students and staff (15 male, 5 female) at the Royal University of Agriculture, Veterinary Faculty in Phnom Penh in September 2017. Finally, students and staff of ILRI participated in a seminar on OneHealth/Ecohealth concepts, food safety global and informal markets with examples from Africa and Vietnam, with about 20 attending.

### Lessons Learned

- There are some potential tensions between the participatory, iterative, building on evidence approach set out in the project proposal and the requirements for information for accountability and planning needed by the Innovation Lab. With support and understanding from University of Florida, the project is managing these.

### Publications and Presentations

1. Unger, F. 2017. Scientific Lecture/Seminar. One Health Ecohealth. Royal University of Agriculture, Phnom Penh.
2. Grace, D. 2017. Flyer. [Safe Food Fair Food for Cambodia](#).
3. Grace, D. Online project profile. [Safe Food Fair Food for Cambodia Project Profile](#).

<sup>1</sup> Note that one additional project has been approved for Cambodia but only preparatory activities were conducted in FY 2017. This Focus project is “Improved pig health and nutrition: the major drivers of profitability and sustainability for smallholder farmers in Cambodia (July 24, 2017 -July 23, 2018), implemented by Dr. M. Tokach from Kansas State University, with collaboration by the Royal University of Agriculture.

<b>Living fences for improved livestock feed in Cambodian smallholder systems</b>		<b>Focus project, June 10, 2017-June 9, 2018</b>
<b>PI Name &amp; Institution:</b> Tom Gill, University of Tennessee	<b>Collaborators:</b> Royal University of Agriculture (RUA), University of Battambang (UBB)	
<b>Description:</b> This project assesses leguminous trees as living fences for supplemental livestock nutrition and for protection of crops in Cambodian smallholder livestock systems. The project has four objectives: 1) Evaluate living-fence species using livestock feeding trials; 2) Improve capacities of farmers to produce and manage living fences; 3) Evaluate constraints and impacts of using living fences on farms and 4) Evaluate the potential to use living fences to protect food crops and fodder.		
<b>Location:</b> Battambang and Siem Riep provinces		

### **Achievements**

**On-station livestock feeding trials using living fence species:** Permission to source seed of Moringa and Leucaena from the Ministry of Agriculture, Forestry and Fisheries in Cambodia was secured and these tree species were planted for field testing on Center of Excellence on Sustainable Agricultural Intensification and Nutrition (CE SAIN) research station in Battambang. In addition, Gliricidia sepium and a new potential species (Acacia pennata) will be included in FY 2018.

**Smallholder training in livestock feed diversification options and living fence production:** This will take place in Q2 FY 2018, due to the delayed project onset.

**Evaluation of constraints and impacts of living fences in on-farm conditions:** These will be done in FY 2018, due to slow pace of obtaining permission for seed purchase.

### **Capacity Building**

The project works with RUA and UBB and will continue to work with them in FY 2018. Efforts with UBB faculty and students consisted to design and plant two species in a living fence demonstration at the UBB farm/CE SAIN Battambang tech park. For CE SAIN, a presentation on the project including rationale, goals, and methods was given to 12 faculty and students in July 2017, and project worked with faculty to design living fence demos for tech park(s).

### **Lessons Learned**

- It may be more difficult than first thought to obtain cattle for feeding trials. An assumption had been made that farmers would be willing to share their cows for trials but now arrangements are being made to try to utilize cattle aggregated for other experiments and projects.

### **Publications and Presentations**

1. Gill, T, Ader, D. 2017. Newsletter article. [Living fences for improved livestock feed in Cambodian smallholder systems](#). Forages for the Future, Issue 4.
2. Gill, T, Ader, D., Hok, L. 2017. Flyer. [Living fences for improved livestock feed in Cambodian smallholder systems](#).

## e) Non-Competitive Activities

In FY 2017, the Management Entity also conducted short-term assessments and trainings in Ethiopia, Rwanda, and Nepal. The topics for these assessments and trainings were identified as part of the prioritization of ASF production and consumption constraints during the scoping visits and Innovation Platforms. Activities of the Human and Institutional Capacity Development team also initiated during the year.

### i) Assessment of Domestic Abattoirs and Butcher Training

**Building capacity of butchers in domestic abattoirs to improve meat hygiene, safety, quality, preservation and value addition – Phase I, assessment.** The activity sought to identify pathways to improve meat safety for both domestic abattoirs and home butchery in Ethiopia, and to increase the value of meat and byproducts. This first phase of this activity took place from October 25 to November 2, 2016 and consisted of an assessment of three livestock markets, five abattoirs, and 18 local butchers, who were interviewed. Interviews were conducted with owners/managers, and a visual assessment was conducted on the facility and (if possible) the process. The team was led by Dr. J. Scheffler, Assistant Professor, Department of Animal Sciences, University of Florida, and Dr. Z. Mekuriaw, the East Africa coordinator of the Livestock Systems Innovation Lab based in Addis Ababa, Ethiopia. A previous survey of butchers by Haileselassie et al. in Mekelle had indicated that a high percentage (61%) of untrained workers and 54% of total workers (i.e., trained and untrained) worked in facilities without a sanitary regulatory system contributing to high pathogen loads in meat. Similar results were observed in this assessment conducted around Addis Ababa. In the 18 butcher facilities visited, none of the workers had any formal training beyond a secondary education. In the five abattoirs visited, butchers had no additional training. The butchers indicated they had a desire to improve meat hygiene and quality, but there was a lack of knowledge of how to make those improvements. Even if infrastructure is inadequate, steps can be taken through employee training to improve sanitary practices that reduce the incidence of foodborne illness.

**Building capacity of butchers in domestic abattoirs to improve meat hygiene, safety, quality, preservation and value addition – Phase 2, training of trainers.** Following the above mentioned assessment, the objective of the second phase of this activity was to increase knowledge in meat hygiene throughout the value chain by conducting a train-the-trainer program. This was done in Adama, Ethiopia on August 25-28, 2017, by the University of Florida's Dr. J. Scheffler and Ms. T. Langford (Animal Sciences graduate student). The event was co-organized by the Feed the Future Innovation Lab for Livestock Systems and the Feed the Future Ethiopia Value Chain Activity, led by Fintrac. Participants (20 total; 2 women) were diverse, and came from the Ministry of Livestock and Fisheries, Ethiopian Meat and Dairy Industry Development Institute, Butchers Association, and abattoirs in Addis Ababa, Tigray, Amhara, Bishoftu, Oromia, and Southern Nations, Nationalities, and Peoples' Region. A pre-course test was administered to assess the knowledge level of the participants.

The training consisted of the following five components: (1) a review of the findings of the first phase of the study; (2) a presentation and discussion on general hazards common in Ethiopian domestic abattoirs and basic cleaning and sanitation, (3) specific butcher and abattoir concepts, as well as open discussion on issues abattoirs and butchers face, animal welfare, and hand washing demonstration using a GloGerm gel and black light; (4) a field visit to Mana Qalma Kristaana abattoir and then to different butchers in four teams, followed by preparation of presentations on what had been observed; and finally (5) development of training programs for the future, with participants planning an agenda and stating the desired audience, topics to be covered, time allotment, and what materials they needed to successfully complete their training. There was a great deal of discussions on the topics, and the groups indicated that a three-day training for abattoir workers and a one-day training for butcher workers would be most appropriate. All 20 participants received a certificate of award due to successful completion of the training. Follow-up training of many more butchers was conducted by the USAID value chain activity; this is briefly discussed in Section VIII.

## **ii) Analysis of Drivers and Barriers of Animal Source Food consumption in Ethiopia**

The purpose of this FY 2016 activity by Drs. T. Wilfong, Research Assistant, and S. McKune, Assistant Professor at the University of Florida, was to (1) increase understanding of the behavioral and sociocultural obstacles that prevent ASF consumption among children under the age of two and pregnant and lactating women (PLW) in Ethiopia, and (2) improve the design of future development interventions or research activities that aim to improve ASF consumption by securing a historical perspective of past interventions, both successful and unsuccessful. The report was completed in FY 2017 and is summarized here. The topic was identified in initial Ethiopia scoping visits of the Feed the Future Innovation Lab for Livestock Systems, and because it is vital to any successful intervention on this theme. The project was initially designed to be a systematic literature review, but due to limited literature available, a scoping framework described by Arksey and O'Malley (2005) was used. This framework includes different stages ranging from identification of research questions and articles, to selection of articles to review and charting of the data, and then summarizing and reporting results and finally, conducting a stakeholder survey. A total of 49 individuals were surveyed, mostly online or through a downloadable survey. The study identified a number of factors impacting availability of ASF, including variability by social stratification, religion, and food taboos, particularly during pregnancy. The study suggests that there is significant variation in what drives ASF consumption among and within regions, households, and individuals.

## **iii) Workshop on Livestock Epidemiology, Data Analysis, and Health Policy**

In addition to its identification during the scoping visits and Innovation Platform meetings of the Innovation Lab for Livestock Systems, this activity emerged as a priority because national government veterinary services are required to deliver animal health programs with limited resources. The purpose of the activity was to enhance the epidemiology capacity for delivery of more efficacious and efficient government animal health services in Rwanda. Its objective was to create opportunities for young scientists and health professionals from various institutions (e.g., UR, Ministry of Agriculture and Animal Resources [MINAGRI], Rwanda Agriculture Board [RAB]) to gain new knowledge and skills in disease surveillance, epidemiologic studies, and animal health research that can impact health policy. The five-day workshop was taught by Dr. J. Hernandez (Professor, University of Florida) and attended by two UR faculty members, three professionals from MINAGRI, and seven professionals from RAB. The workshop included presentations on (1) review of animal disease surveillance systems in Rwanda; (2) an introduction to epidemiology, data analysis, and health policy; (3) laboratory tests used for diagnosis of livestock diseases in Rwanda; (4) evaluation and application of diagnostic tests; (5) design and analysis of epidemiologic cross-sectional (prevalence) studies and case-control studies. Additionally, a discussion was held on the roles that epidemiology can play on health policy using local examples, and participants had the opportunity to present research data, surveillance data or project progress for feedback by the Instructor. The workshop included a pre-evaluation and post-evaluation, which indicated that participants gained new knowledge in epidemiology and animal disease surveillance during the workshop, and that the participants were quite satisfied with the training.

## **iv) A Brief Assessment of the Government of Rwanda's "One Cow per Poor Family" Program from a Gender, Nutrition and Health Perspective**

The aim of this September-October 2016 activity conducted by Dr. K. Colverson and Ms. K. LeBeau of the University of Florida was to understand factors limiting the efficacy of the health and nutritional impacts of the Government of Rwanda's GIRINKA program, particularly the possible gendered gap that exists within the program, and to recommend strategies to increase its effectiveness from a gender perspective. Methods included a review of peer-reviewed and gray literature on the sociocultural and socioeconomic barriers and factors influencing milk and dairy product consumption in Rwanda, and key informant surveys using separate questionnaires for groups, organizations, and farmers/beneficiaries. The majority of the questions were open-ended to obtain in-depth responses. Meetings and interviews were conducted in-country from September 15-23, 2016, which included a one-day trip to the field to interview smallholder farmers. The study highlighted the program's successes, including increased milk production, improved soil fertility and crop production, increased family income for poor households, reduction in malnutrition in poor families, and improved

community cohesion. The report also discussed some of the challenges, including improper beneficiary preparedness training, lack of veterinary and extension services, the fact that excess milk was often sold rather than consumed, lack of labor for care of cows, the fact that family selection criteria was at times neglected, lack of monitoring and evaluation data, and lack of understanding of the link between gender and nutrition issues. Recommendations given include the need for more program monitoring and evaluation and greater preparation and training of beneficiaries, more capacity development to integrate gender and nutrition into livestock programs and for gender analysis of dairy value chain, and lastly for consideration of small livestock as an additional option for smallholder farmers.

#### **v) Rapid Assessment of the Gaps in Dairy Cattle Feeding and Management that Constrain Milk Quality and Quantity in Rwanda**

This assessment by Dr. G. Dahl (Professor, University of Florida) and Dr. R. Roberts (Professor, Penn State University) was conducted from December 5 to 9, 2016. The purpose was to: (1) obtain a clear understanding of the gaps in feeding and management of cows that constrain milk quality and quantity, and (2) identify areas of engagement for the Livestock Systems Innovation Lab to develop training and extension education. The rapid assessment consisted of various visits to farms, feed mills, milk collection centers (MCC), processing centers, and discussions with various dairy sector stakeholders including the RAB of the Ministry of Agriculture, University of Rwanda's School of Veterinary Medicine and Animal Science, Land O' Lakes Rwanda Dairy Competitiveness Program II, International Fund for Agricultural Development, the Rwanda Council of Veterinary Doctors (RCVD), the Rwanda National Dairy Platform, and the Rwanda Agriculture Livestock Inspection and Certification Services. The team made recommendations for further efforts needed, including the following: (1) Development of a curriculum and training for veterinary students and practitioners regarding cow nutrition, reproductive management, and milk harvest protocols especially with an emphasis on the practical management appropriate to Rwanda. Mastitis prevention and treatment training are critically needed as further development of domestic and export markets will be limited by poor milk quality; (2) Improvement in protocols for milk testing at the MCC's, along with additional training on milk handling. There may also be a way to significantly improve quality of milk through introduction of pasteurization at the MCC's by working with IFAD to fund equipment purchases; and (3) Further development of training on dairy nutrition for smallholders to increase yields and animal health and productivity. It was clear that the nutrition of many GIRINKA cows was lacking and the sustainability of that program may be limited because of reproductive failures due to anovulation. A survey of the program to determine the number of GIRINKA cows that actually have more than one calf and continue to provide milk to the family is an important next step. Further work is needed on the following aspects: (1) Research and training on milk quality, as only 20 of the 77 MCCs have fully satisfied the seal of quality requirements including sampling. Industry players must develop a system of self-regulation while the government needs to move from provider to facilitator and work with RCVD to develop continuing education in support of their members. (2) There is a need for decentralization and privatization of artificial insemination (AI) with oversight from RCVD. The RCVD has the mandate for all veterinary and AI services in Rwanda. (3) The financing mechanism of the Rwandan National Dairy Platform needs to be evaluated and alternatives assessed, as the current set up may not be financially viable. Additional training is expected as a follow-up from this activity.

#### **vi) Cost of Production and Competitiveness for Production of Milk in Rwanda and Nepal**

This study by Dr. J. Vansickle (Professor, University of Florida) and Ms. K. Ojo (graduate student, University of Florida) was conducted in July-August 2017 in Rwanda and Kathmandu. Its purpose was to collect data on the cost of milk production, build a consensus cost of milk production budget, and get information about existing policies in the dairy sector of the two countries. In Rwanda, meetings were held with 14 stakeholders from the Rwanda Agriculture Board (RAB), Kahanga Sector- Kicukiro District, University of Rwanda (Agricultural Economics and Rural Development Department), Dairy Farmers Representative (Ikusanyirizory Amata Milk Collection Centre), Premium Animal Feed Industry, Heifer International, Land O'Lakes International Development, Dairy Farmers Representative from Kicukiro District, FAO Livestock program,

Rwamagana district in Eastern Province, Rwanda Board of Veterinarian Doctor, and a livestock private consultant. In Nepal meetings were held with the National Dairy Development Board, Dairy Industry Association, Nepal Agricultural Research Council (NARC), Nepal Dairy Private Limited, Heifer International Nepal, Ministry of Livestock, HICAST, Sustainable Action for Resilience and Food Security, SUHAARA project, lead farmers in Devghat and Milk Collection Centre, and Agriculture and Forestry University. The interviews conducted confirmed the findings of the literature review indicating that the major issues with dairy industry are seasonality of weather, the market problem (informal and formal market), low consumption of milk, the high cost of concentrate feed, and shortage of water. The informal market poses a major risk to the consumer health. In Nepal, an important problem affecting the cost of milk production, and therefore competitiveness, is the fact that non-productive animals cannot be removed from the farm, for cultural reasons, and therefore they increase feed costs per liter of milk produced on the farm.

### **vii) Rapid Assessment of the Gaps in Dairy Cattle Feeding, Management and Milk Processing that Constrain Milk Quality and Quantity in Nepal**

This study was conducted by Drs. A. De Vries (Professor, University of Florida) and K. Kaylegian (faculty, Penn State). The purposes of the assessment was to (1) obtain a clearer understanding of the gaps in feeding and management of cows, as well as milk processing, that constrain milk quality and quantity in Nepal; and (2) identify potential points of intervention for inclusion in (new) training materials for stakeholders and training of trainers. A comprehensive review of the literature, training curricula, and findings on the dairy value chain in Nepal was completed in FY 2016 and formed the background information for the assessment team prior to the assessment visits. This review is briefly summarized below. The rapid assessment in Nepal in February 2017 consisted of visits to farms, milk collection centers, milk chilling centers, processing centers, and discussions with various dairy sector stakeholders to get a holistic view of the challenges and opportunities for training in the Nepal dairy sector. The team made general observations and identified issues constraining the dairy sector. Recommendations included addressing the high price of feeding ingredients to improve dairy cattle rations, and providing incentives for dairy farmers, Milk Collection Centers and milk chilling centers to provide milk with higher milk quality. Such incentives can be monetary or cultural, and application of concepts from behavioral economics should be considered to formulate such incentives. Additional training is expected as a follow-up from this activity.

### **viii) Human and Institutional Capacity Development Activities**

Approval for the Human and Institutional Capacity Building (HICD) team's non-competitive proposal submitted by the HICD Cross-cutting theme leader and Research Associate, was granted by USAID on June 14, 2017. During the year, the HICD team collaborated with AOI and CCT leaders to troubleshoot and strengthen capacity development work plans and training activities; completed two HICD desk studies on the capacity of livestock systems in Niger and Rwanda; and participated in Innovation Platform meetings. The team also began gap analysis activities in Nepal which took the form of two workshops in December 2016. These workshop were held with Agriculture and Forestry University and HICAST University to identify key human and institutional capacity gaps and needs within the institution. From FY 2018 onwards, the team will be working with AOIs, CCTs, and sub-awardees to align their training efforts with the capacity development gaps that were identified in its gap analyses. It is anticipated that integration of HICD activities into their activities will further support gap filling and will result in strengthening the capacity development activities planned in the context of AOIs, CCTs, and subaward projects. For example, the Nepal assessment will likely lead to collaboration with AOIs in topics such as advanced statistics, laboratory skills, and veterinary skills.

## Publications and Presentations: Non-competitive Activities

1. Dahl, G. 2017. Scientific Lecture/Seminar. The Land Grant University System - Importance to agricultural advancements in the US and beyond. Royal University of Agriculture, Phnom Penh, Cambodia.
2. Dahl, G. 2017. Scientific Lecture/Seminar. Strategic use of livestock to improve food security, health and livelihoods. University of Rwanda, Kigali, Rwanda.
3. Scheffler, J. 2017. Scientific Lecture/Seminar. Current status of Ethiopian Butchers, pathways for capacity building. Ethiopian Butchers Association Board of Directors, Addis Ababa, Ethiopia.
4. Wilfong, T., Havelaar, A., & McKune, S. 2017. Poster. From Chickens to Campylobacter, How Environmental Enteric Dysfunction is affecting a generation in Ethiopia. EPI Research Day, University of Florida.
5. Williams, R. 2017. Rwanda HICD Brief. Under review.
6. Williams, R. 2017. Niger HICD Brief. Under review.

## VI) Associate Award Research Project Reports

### a) Feed the Future Peste des Petits Ruminants Vaccine Associate Award, AID-OAA-L-15-00003

#### Project Description

The *Peste des Petits Ruminants* (PPR) Vaccine Associate Award (PPR VAA) is a three-year (February 10, 2017-February 9, 2020), \$2.5 million dollar project implemented by the University of Florida with Tufts University, and several country-specific and international partners. The target countries of the project are Uganda and Kenya, and it is implemented under the Feed the Future Innovation Lab for Livestock Systems, a \$49 million, five-year (October 1, 2015-September 30, 2020) Leader with Associates Cooperative Agreement.

The objectives of the PPR VAA project are (1) to validate and accelerate the commercialization of a thermostable PPR vaccine by providing support to proven commercial institutions capable of quality vaccine production, and (2) to pilot vaccine delivery programs. The project will achieve its objectives through a combination of tools, which proved successful in the Rinderpest eradication by ensuring that vaccinations are targeted to areas with high transmission rates, however remote, and in those areas achieve high coverage with effective vaccines. The tools include:

- Use of a thermostable vaccine to develop lifelong immunity in vaccinated animals;
- Vaccination relying on Community Animal Health Workers (CAHWs) for wide reach resulting in 80% herd immunity;
- Use of participatory epidemiology to achieve a nuanced understanding of population dynamics and factors impacting vaccination coverage, and thereby appropriate vaccination strategies; and
- Use of modeling to detect populations with high transmission rates for targeting in the vaccinations.

Using these tools, the PPR VAA project strives to achieve sustainability (leading to eventual eradication of PPR) by emphasizing commercial and efficient avenues for vaccine delivery as follows:

- *Facilitation of profitable production and marketing of a thermostable PPR vaccine* in an African laboratory as part of a time-bound eradication program with a demand curve that rises to 1 billion doses per annum within 5 years and then falls to zero within 10-12 years.
- Validation of vaccine delivery methods for *interrupting the transmission of PPR virus* from defined communities using *spatially and temporally focused vaccination* with a thermostable vaccine that *maximizes*

*participation* by all stakeholders, including women, and contributes to building *sustainable animal health service markets* and increased *livelihoods benefits from small ruminants*.

In Uganda, the efforts at the community level are based on interactions among three main stakeholders: livestock keepers, community animal health workers (CAHWs), and elders and leaders of the kraal (*nawi*). Currently CAHWs are rare in the project regions and are mostly restricted to small urban centers. Selection of entrepreneurial and excited potential new CAHWs and their sensitization, trainings, and incentiviation will facilitate wide coverage of good quality vaccination. As highly respected members of the target communities, the involvement of elders and *nawi* leaders will improve the quality of vaccine delivery as they will be involved in the selection of the CAHWs and will supervise their vaccinations to ensure proper coverage. The increasing trust built between the CAHWs and livestock producers will ensure producers allow their animals to be sampled to monitor seroconversion, an important indicator of the progress of eradication efforts.

The research methodology, before and after the vaccinations, involves four phases of data collection:

- The first formative research—the site assessment: This will employ semi-structured interviews in systematically selected sites to acquire knowledge about key variables, and incorporate a variety of participatory tools to collect epidemiological and socio-economic data. Where needed, this will be supplemented with purposively selected sites to address issues that may arise during the project.
- Baseline and two annual household surveys: These combine structured household questionnaires with sero-sampling of animals to estimate herd immunity. Sites (n=50) will be selected using randomly generated geographic coordinates within the targeted communities; the nearest herd to the coordinates will be selected. Ten households (HH; ten per site/herd) within 2km will be randomly selected, including any HH represented by the head or a decision maker who is currently involved with the targeted herd. Twenty-five sites in each of two communities will be identified through stratified and clustered random sampling. One herd and 10 associated households will be targeted at each site, for a total n = 50 herds, from which sera will be collected, and a total n = 500 HH, in which surveys will be implemented. These herds and HH will be identified through this random sampling approach, without reference to other interview activities.
- Baseline participatory epidemiological assessments and post-vaccination participatory assessments: These supplement the previous methods. During implementation, there will also be six monthly assessments of the incidence of PPR outbreaks using participatory methods. To make best use of resources and participants' time, these will be integrated into the baseline and annual post-vaccination participatory assessments when the timing of these activities coincides.
- Focused data collection activities: The timing of these will be determined by disease and health events in the field. These focused activities include outbreak investigation, sampling to estimate the basic reproductive number of PPR virus, and investigation of reports of adverse events related to the vaccination activity.

Qualitative data from participatory interviews will be analyzed using the process of triangulation during debriefs after each interview session (where the study team will discuss perceptions of the stakeholders and assess patterns in the information provided). Thematic analysis of interview notes and recordings (if available) will be compared with the debrief notes. Specific goals of this qualitative analysis are to: (1) Develop lexicons of traditional terminology and case definitions for disease; (2) Develop a consensus timeline for the introduction and evolution of PPR in the region; (3) Develop PPR disease prioritization and impact scores relative to other diseases; (4) Assess the mechanisms of PPR maintenance within the region; and (5) Identify factors and practices in animal health service activities that contribute to dependency or resilience or both and the underlying circumstances. Serosurveys will be analyzed to estimate herd immunity. Data will be visualized and described with basic descriptive statistics, and results will be compared using the chi-squared test to determine statistical significance. Questionnaire data will be analyzed descriptively and in comparison with



serologic results. Logistic regression will be used to test for associations between herd level variables (size, distance to sub-district center, ethnicity, etc.) and individual herd sero-prevalence. As a result, the basic reproductive number will be calculated from the specific samples collected after documented outbreaks for this purpose using the final size equation.

$$R_0 = \ln(1/(1-h))$$

Where  $R_0$  is the basic reproductive number and 'h' is the herd immunity level.

The project will have direct impact in the Karamoja, West Pokot, and Turkana regions of Uganda and Kenya through reduction of PPR mortality and morbidity, through more sustainable animal health services, and through improved understanding of the epidemiological situation. The M.S. students trained by the project will improve capacities in animal health in the two countries, while the improved knowledge of the performance of the thermostable vaccine, participatory epidemiology, CAHW-based vaccination systems, and use of modeling for epidemiological targeting will contribute to the international efforts to improve understanding of the PPR control, and eventual eradication methods.

## **Project Collaborators**

*Globally and in both countries*

- Tufts University
- Food and Agriculture Organization of the United Nations (FAO)
- African Union Inter-African Bureau for Animal Resources (AU-IBAR),
- Pan African Veterinary Vaccine Centre (PANVAC)
- Participatory Epidemiology Network for Animal and Public Health (PENAPH)
- Intergovernmental Authority on Development (IGAD)
- Global PPR Research Alliance (GPRA)

*Uganda*

- Mercy Corps
- Makerere University - College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB)
- Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)
- Participatory Epidemiology Network for Uganda (PENU)

*Kenya*

- Ministry of Agriculture Livestock & Fisheries
- Kenya Agricultural and Livestock Research Organisation (KALRO)
- Kenya Veterinary Vaccines Production Institute (KEVEVAPI)
- International Livestock Research Institute (ILRI)

## **Achievements**

FY 2017 was the project's first year and it was key to building good collaborative partnerships and more detailed plans for future work. During the year, the project researched various alternatives for a second country and, as requested by USAID in its award, proposed a second country (Kenya) to USAID with justifications, which was approved. Unexpectedly, the Botswana Vaccine Institute (BVI) withdrew from the agreed collaboration and the project had researched other potential thermostable vaccine suppliers and selected the Kenya Veterinary Vaccines Production Institute (KEVEVAPI) instead.

**Management Entity Activities:** The project team developed key project documents for USAID [the Performance Management Plan (PMP), the Environmental Management and Mitigation Plan (EMMP), the Open Data Plan, and the work plan] by May 10, and acquired necessary approvals from the Institutional Review Board (IRB; May 25 for Makerere, September 26 for Tufts, and November 1 for the University of Florida) and the Institutional Animal Care and Use Committee (IACUC, August 15). The project also researched and submitted to the USAID, by the June 10 deadline, a proposal that Kenya should be the second target country, and within Kenya, Turkana and West Pokot should be the target countries. This was approved on August 21. The June 9 memo to USAID presented the following key justifications for this proposal: (1) Kenya is a Feed the Future country, and, while only Turkana county is in the Feed the Future zone of influence, working in West Pokot would be advantageous as it is contiguous with and in the same grazing (and epidemiological) zone with Amudat district in Uganda, which has Karamoja's highest livestock population; (2) There is potential to make significant impact in Kenya due to the importance of small ruminants and endemicity of PPR in the focal regions, the important role of the proposed target areas in the spread and maintenance of PPR, and the opportunity to test a different private sector-driven model of animal health service provision; (3) Supportive policy framework and established, supportive, engaged and motivated partners; and (4) There is a possibility to leverage other ongoing initiatives.

**Scoping visit to Uganda:** The scoping visit, by the Livestock Systems Innovation Lab Director, the Lead Scientist, and the Project Coordinator took place on April 9-24. Its objectives were to introduce the project to the USAID mission and partners, and discuss areas of collaboration with them. These potential partners include the Ministry of Agriculture Animal Industry and Fisheries (MAAIF), Mercy Corps, Makerere University, FAO, and the Participatory Epidemiology Network of Uganda (PENU). The project met with other relevant stakeholders such as Karamoja Resilience Support Unit (KRSU) project and the National Drug Authority. For the last ten days of the mission, the Lead Scientist and Project Coordinator also conducted an initial assessment in the target area, and finalized the work plan with the main implementers.

The scoping visit resulted in initiation of strong new partnerships and renewal of old ones, as the Lead Scientist and Project Coordinator had previously worked in Uganda with some of the partners. Important information was gained on recent PPR-related developments in Uganda that informed the design of the study in Karamoja. It was clear that MAAIF, an important collaborator, was excited about the project as it contributes to their PPR strategy. Importantly, Mercy Corps has recently conducted a survey of active CAHWs operating in the various districts and commissioned Makerere University to review the CAHW training curriculum; this will be the new standard in Uganda, and it will be complemented by a certification system for various levels of CAHWs. PENU has trained over 130 individuals in Uganda and will provide training and communication support to the program. Since 2007, FAO has supported PPR vaccination campaigns in Karamoja, with over 2 million animals vaccinated in 2016-2017. The field visit to five of the seven districts in Karamoja region (Nakapiripirit, Amudat, Moroto, Kotido and Kaabong) included meetings with officials and preliminary discussions with livestock keepers (approximately 95% men) and/or CAHWs. The relative importance of PPR varies per district, and while it earlier seemed to have come in waves, it now mainly comes at the onset of May/June rains and affects mainly young animals. Willingness to pay for vaccines varied, with some insisting that the government should pay, while others felt they would pay if it would increase availability of the vaccine. District data on vaccinations is not digitalized and needs to be done to assess true vaccination coverage. At sub-county level, CAHWs number 21-35, but likely not all are active. The women CAHWs (20-30% of total) noted that men accept their services. Engagement of CAHWs in FAO efforts had been sporadic and should be systematized. Limited number of vaccines and their poor quality were cited as problems, and grazing by animals from Pokot and Turkana in Kenya were noted.

**Scoping visit to Kenya:** The project also initiated preliminary activities in Kenya. An initial visit to Kenya was made September 25-October 3. The trip involved the Livestock Systems Lab Director, Lead Scientist, Project Coordinator, and the Karamoja Site Coordinator. Its objectives were (1) To introduce the project to the USAID mission; (2) To introduce the project and discuss areas of collaboration with officials from the Department of Veterinary Services, Kenyan Agricultural and Livestock Research Organization (KALRO); Kenya Veterinary Vaccines Production Institute (KEVEVAPI), SIDAI, and ILRI; (3) To discuss with KEVEVAPI the purchase of PPR vaccine for use in Uganda; and (4) To meet other relevant stakeholders such as FAO and African Union Inter-African Bureau for Animal Resources (AU-IBAR). In general, there was strong support for the project, and a great deal of relevant information was gained from this initial visit. KALRO and the Department of Veterinary Services work closely together and are interested in participating in various areas of work, including the assessments and laboratory work. KALRO has already started field testing its thermostable vaccine at a government farm, and will submit the vaccine to GalvMed for thermostability testing. It was agreed that the KALRO vaccine could be used in Kenya once it passes the PANVAC tests as well as the Thermovac vaccine. KEVEVAPI is supportive of the project and ready to produce the Thermovac vaccine, pending USAID approval. ILRI's Accelerated Value Chain Development (AVCD) project working in Turkana has a good relationship with the country officials, and will introduce a disease reporting system that is already successfully implemented in two other counties and is mostly supported by the county governments. Consequently, it would make sense to build on the AVCD presence in Turkana. By law, CAHWs are not allowed to operate in Kenya. Instead, they are called community disease reporters (CDR), and there are also many animal health technicians (AHT) who qualify after a two-year training. The AVCD project is in discussion with the government to have AHTs deliver selected vaccinations to make their activities more economically viable. This is an ongoing process, and may be less likely for diseases such as PPR which are part of national and regional eradication strategies. However, the DVS recognized that involvement of the AHT in this project is for research purposes only and therefore it may be allowed, especially if there is county interest. SIDAI is a company aiming to establish a network of franchised and branded Livestock Service Centers in Kenya and will expand into Turkana county as part of a new USAID-funded resilience project. They also conduct vaccination programs for some county governments and for GalvMed. The FAO team explained their involvement in the PPR control and eradication efforts in Kenya and the East African region. In Kenya, they have been vaccinating small ruminants in 7 counties, including Turkana, and plan to deliver 10 million PPR vaccine doses in 4 years (2015-2018 – 2.5 million were distributed in 2015 alone). Also, AU-IBAR welcomed the project as its Animal Health Systems program targets PPR control and eradication prominently.

**Contracting:** The project also recruited the Karamoja site coordinator in September and developed subawards for Tufts University and Mercy Corps. The subaward for Makerere University was finalized early FY 2018.

**Vaccine procurement, import to Uganda, and laboratory validation:** The project had envisioned that, during FY 2017, it would procure the vaccine, import it to Uganda, and facilitate the comparison of different thermostable vaccines by GALVmed and testing of the vaccine at the African Union Pan African Veterinary Vaccine Center (PANVAC). These activities did not take place because on July 7, the Botswana Vaccine Institute, which had been taken over by Merial, informed the project that, for reasons related to its business strategy, it would not produce the vaccine, despite having agreed to so during the proposal development phase. The project quickly researched other alternatives, giving preference to Africa-based suppliers, due to the existing relationships with GALVmed and PANVAC during the proposal development. The project explored the potential to source the vaccine from KEVEVAPI for both countries because the proposal for selecting Kenya as the second country had just been submitted and KEVEVAPI is a capable vaccine producer that supplies vaccines to the region. During its September visit to Kenya, the project team received

information on KEVEVAPI's current vaccine production experience and capacity, and decided to submit a proposal to procure the vaccine from KEVEVAPI to USAID in early FY 2018.

**Sociocultural and epidemiological assessment:** This activity is ongoing. The socioeconomic assessment led by UF will be done in January 2018. The epidemiological assessment led by Tufts University has started in four districts: Amudat, Moroto, Kaabong, and Kotido. Interviews focused on diseases present, past vaccination activities, transhumance patterns, presence of CAHWs, and veterinary drug shops. It was clear that the low vaccination coverage (estimated at 13.8%) is not sufficient to control PPR and probably contributes to suppressed, endemic disease consistent with the livestock owner descriptions of disease occurrence. The most probable explanation for the lack of recognized outbreaks is insensitive surveillance and disease reporting systems, and, therefore, the project's efforts need to include strengthening surveillance, disease detection, and diagnosis as part of the targeting and impact assessment activities. It was also clear that, although large numbers of CAHWs are present in Kotido, few are active in the provision of routine services in the kraals. Project implementation will need to empower kraal leaders to designate the CAHWs they consider active and appropriate. It is possible that new candidates may need to be selected. Finally, it is clear that the implementation should target livestock owned by social groups rather than the livestock present in administrative regions at a point in time. The goal should be to cover the small ruminants owned by the households based in the target parishes.

**Selection of target districts based on epidemiological findings:** The study population will include people and small ruminants from two communities within the Karamojong region. These communities are populations of people and animals located in a particular district, although the district itself is not a meaningful unit for selection. Combined, the two communities will own an approximate total of 500,000 small ruminants. The study population will be purposively selected, based on factors related to herding practices, animal population structure, and epidemiological analysis of historic disease patterns in the region. The vaccination interventions will seek to cover at least 80% but preferably 100% of the small ruminant population in the selected study communities (estimated  $n = 500,000$  small ruminants). The criteria for community selection will include:

- An important role in maintaining disease in the region as evidenced by high population density, movement, contact and transmission in the past;
- A small ruminant population that fits within the constraints of the project's resources;
- An internal and external epidemiological community contact structure that can be clearly delineated; and
- Community cross-border movements that allow sufficient access for delivery of interventions and information collection.

The semi-structured interviews to gather disease information have taken longer than anticipated, and therefore are still ongoing and the sociocultural assessment is scheduled for January 2018. The lack of easily available epidemiological data, and the fact that the information is not available in a digital format, has further delayed the selection of the target areas. However, based on the semi-structured interviews conducted to date, the target districts that fulfill these criteria and, therefore will (likely) be selected, are Amudat and Kotido. However, additional information is needed to refine the area to the subcounty and kraal level. This information will be solicited through further sociocultural and epidemiological assessment in Q2 FY 2018. Final decision on the target districts will be made by February 2018.

**Set up epidemiological monitoring system in Karamoja (Uganda):** This activity has been delayed as the formative research phase has taken longer than expected. The disease data is scattered and non-digitized. Discussions with MAAIF personnel participating in surveillance and epidemiological research on PPR in

August revealed that data relevant to the epidemiology of PPR was not gathered in one place, but was distributed with different individuals in various offices and organizations. For the most part, data sets reside with the individuals who were tasked with the individual studies (or regional components of studies). For several of the data sets, only crude summaries were available and figures at the sub-county or parish level were not available. For the coordination of PPR eradication, it is essential that available data is collated and properly analyzed. The project has an important role to play in assisting the national PPR coordination to aggregate, synthesize, and interpret existing data on PPR as part of national strategic planning. A mobile phone-based syndromic surveillance system was set up as part of an FAO-funded project that finished in 2017, but more details are needed on the system's performance before deciding if it should be incorporated in the project.

**Conduct baseline survey:** This activity by Makerere and UF's Institute of Food and Agricultural Sciences has not been done, but is planned for January 2018. Reasons for the delay include, as discussed earlier, the unexpected long time it has taken to conduct interviews and lack of easily accessed and comprehensive epidemiological data.

**Location and context appropriate business models developed for Karamoja, starting with assessments of business models/incentives:** This Tufts-led activity is ongoing and started with a dialogue to define business models among the project team and partners in Uganda. This included individual meetings with various stakeholders such as District Veterinary Officers (DVO), CAHWs, and drug store owners. Additionally, the project met with the President of the Karamoja Livestock Development Forum (KLDF), a regional group formed by government officials, kraal leaders, and CAHWs. A meeting with the entire forum is planned for the end of November 2017 in Moroto. These meetings will continue in early FY 2018, with the expectation of finalizing the business models by January-February 2018.

### **Capacity Building**

One of the objectives of the project is to facilitate the development of a targeted strategy for the eradication of PPR in the target countries. For now, in Uganda, the project has been actively engaging with MAAIF to enhance capacity to collate and analyze data on PPR. Two face-to-face meetings with a larger group and a number of individual meeting with selected individual from MAAIF have already taken place and email exchanges are on-going.

The project also seeks to enhance capacity to deliver high coverage vaccination in a focused manner through development of better institutional arrangements to deliver the vaccine. In Uganda, this process is working through the KLDF with all stakeholders to develop better business models based on payment for quantity and quality of vaccination coverage, rather than entitlement payments such as allowances and per diems. Part of the process is to develop effective systems of validation of work and to empower customers (livestock owners) to be part of the validation process.

At the human capacity building level, the project seeks to engage PhD and M.S. students in project research activities. Two postgraduate students have already been identified by Makerere University – COVAB, and are expected to start on the project in early November 2017. Also in Kenya, we foresee involving postgraduate students linked to the KALRO's work. In addition to these opportunities, there will be other opportunities for M.S. students from Kenya and Uganda as well as students from other countries to be involved in the project, particularly in immunology, epidemiology, economics, marketing, and participatory methods, One Health, veterinary anthropology, and veterinary public health. The project will not have funding to support this additional student involvement but can help in terms of guidance in research design and assistance with data analysis. Students may have access to data gathered by the project where it is mutually agreed. Add on

initiatives may be included if the work is synergistic with PPR project objectives provided the students have separate funding for any additional costs.

### Lessons Learned

- Need for good coordination among project partners including clarifying possible questions regarding activities, timelines and work plan.
- The number of in-country partners may be different in Kenya from that in Uganda because there does not seem to be a potential NGO partner operating in both counties that could lead the field work like Mercy Corps is doing in Uganda.
- From the outset, we needed to focus efforts on obtaining data relevant to the project from local agencies. In Uganda, we first approached the central (national) agencies to obtain data on small ruminant populations and previous PPR vaccinations. Responses were slow, causing delays, and the data eventually received was not detailed enough for our needs. In Kenya, we will start by requesting data from both the central and the county or sub-county veterinary services, triangulating the data from the two sources.

## VII) Human and Institutional Capacity Development

### a) Short-term Training

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained		
			M	F	Total
Nepal	2 Trainings on use of cell phones and software for disease reporting	Sentry women and school principals/teachers	17	11	28
Nepal	Training Program for Newly Recruited Women Sentries	Women sentries	0	9	9
Nepal	17 Trainings on livestock disease recognition and control	Members of women's groups	98	673	771
Nepal	9 Trainings on livestock disease recognition and control	Livestock club members at schools	155	199	354
Ethiopia	15 Trainings on syndromic surveillance for livestock health	Producers and public and private veterinarians	362	91	453
Rwanda	Train-the-Trainers on mycotoxin sampling strategy	Project sample collectors (including students and in-country collaborators)	6	2	8
Rwanda	Lab Safety: core concepts & ELISA	Project students and in-country collaborators	9	6	3
Rwanda	Mycotoxin Analysis: ELISA Training	Students and faculty from the University of Rwanda	19	7	26
Ethiopia	Introduction to GIS (with applications to the livestock sector)	Ethiopian Economics Association members	25	2	27
Nepal	Training on quality milk sample collection, hygiene, and sanitation	Animal health workers/technicians	11	4	15
Nepal	Good Husbandry Practice (GHP) training t	Front line extension workers	16	4	20
Nepal	14 GHP trainings to dairy farmers	Dairy farmers	80	140	220
Nepal	Training on mastitis tests, milk microorganism identification of causative microorganisms	Lab staff and students	4	4	8
Nepal	Training of on dairy animal nutrition	Livestock technicians in government and non-government sectors	10	8	18

Nepal	Use of Feeding Support Tool/ Ration Balancing software	Technicians and staff from milk collection centers	18	2	20
Nepal	8 Trainings on Dairy Animal Nutrition	Farmers in 3 districts	78	89	167
Ethiopia	Young livestock respiratory and diarrheal pathogen overview; biologic sampling methods, diagnostics, and study design	Graduate students from Gondar University, ALIPB, and NAHDIC, and 1 laboratory technician	5	3	8
Ethiopia	Livestock feeds mycotoxins sampling and testing	9 in government, 3 service providers, 8 NGO workers, and 5 in academic organizations	24	1	25
Ethiopia	Warner Bratzler Shear Force	Researchers (2 from universities and 6 from a government agency)	5	3	8

## b) Long-term Training

Name (first, last)	Sex	University	Degree	Major	Program End Date (month/yr)	Degree Granted (Y/N)	Home Country
Assouman Usabyimana	M	University of Rwanda	Master's	Agribusiness	June 2019	N	Rwanda
Alemneh Kabeta	M	Hawassa University	PhD	Human Nutrition	August 2020	N	Ethiopia
Tefera Timketa	M	Oda Bultum University	PhD	Tropical Animal Production (Meat)	October 2018	N	Ethiopia
Birhanu Addis	M	Oda Bultum University	Master	Food Science	October 2018	N	Ethiopia
Dadi Zenebe	M	Oda Bultum University	Master	Food Science	October 2018	N	Ethiopia
Muleta Bermedum	M	Oda Bultum University	Master	Animal Production	October 2018	N	Ethiopia
Chalachew Yitbarek	M	Gondar University	Master	Microbiology and Epidemiology	July 2019	N	Ethiopia
Aklilu Feleke	M	Addis Ababa University	PhD	Molecular epidemiology	July 2021	N	Ethiopia
Selenat Getachew	F	Addis Ababa University	Master	Neonatal health	July 2019	N	Ethiopia
Beyenech Gebeyehu	F	Addis Ababa University	Master	Pathobiology	July 2019	N	Ethiopia
Shirete Belete	M	Addis Ababa University	Master	Pathobiology	July 2019	N	Ethiopia
Abebe Olane	M	NAHDIC	Master	Microbiology	July 2019	N	Ethiopia
Alice Ingabire	F	University of Rwanda	Master	Animal production	August 2018	N	Rwanda
Janvier Twambazimana	M	University of Rwanda	Master	Animal production	August 2018	N	Rwanda
Jean Baptiste Ndahetuye	M	University Of Rwanda/ Swedish University of Agricultural Sciences	PhD	Animal health	December 2019	N	Rwanda
Bhoj Pokharel	M	Tribhuvan University	Bachelor	Agriculture	July 2017	N	Nepal
Rupesh Kafle	M	Agriculture and Forestry University	Master	Animal Nutrition	December 2017	N	Nepal



### c) Institutional Development

Institution Name	Institution Type	Description of Institutional Development Given
Oda Bultum University	University	Received a Warner-Bratzler shear force machine for measuring meat tenderness, an important piece of equipment for assessing preferences of taste panels.
Hawassa University	University	
Jigjiga University	University	Mentorship in developing a conference.
Aklilu Lemma Institute of Pathobiology, Addis Ababa University	Research	Support given to one administrative staff assistant, in addition to supporting graduate student research. Procurement of critical supplies in U.S. that have been transported to Ethiopia to establish laboratory diagnostic assays for bacteria and virus identification. Real-time PCR capacity is being developed at ALIPB through the set-up of an existing PCR machine and computer for virus identification in the study of a bovine respiratory disease protocol by UC-Davis. This aims to increase capacity for conducting real-time qPCR on bovine viral respiratory pathogens, along with identifying bovine diarrheal pathogens, and measuring immunoglobulin concentration in calf serum.
Gondar University	University	Received laboratory and field sampling supplies, protocols, etc. to develop their capacity for conducting bacterial culture on respiratory nasal swab samples and diarrheal samples, along with detection of rotavirus in calf diarrhea samples.
NAHDIC	Research	Provision of bacterial culture laboratory supplies (agar, broth, etc), including bacterial isolation supplies for their Omni Biolog system, which are difficult to procure in Ethiopia.
University of Rwanda	University	Romer sample grinding mill was placed in the Food Engineering Lab, a critical piece of equipment for preparing samples for mycotoxin analysis.
University of Rwanda	University	Trainings with students and the lab technician to help avoid accidents in the lab and protect students during lab activities.
VDFACA	Government	Mycotoxin testing equipment provided: CHARM-EZM readers and testing supplies to perform mycotoxin testing in feeds.
Bahir Dar University	University	
Mekelle University	University	
Royal University of Agriculture	University	Worked directly with two RUA faculty on the design and development of living fence demonstrations to be grown at CE SAIN tech parks in Battambang and Siem Reap.
University of Battambang	University	Worked with students and faculty under the Sustainable Agriculture MS program at UBB to help design and provide labor for initial planting of two living fence species at the Battambang CE SAIN tech park.
Regional Veterinary Laboratory, Surkhet; Government of Nepal	Research	Capacity building of laboratory staff on bacterial isolation, identification and antibiotic sensitivity test. Supply of laboratory equipment and reagents (refrigerator, autoclave, glasswares) to conduct all milk microbiology works.
HICAST	Academic	Capacity building of HICAST veterinary students on carrying out baseline survey and conducting all milk microbiological assays.
Dairy Co-operatives	Producers organizations	Supply of Milk checker to conduct milk conductivity tests. Capacity building of staff to run conductivity test on milk samples received at dairy cooperatives. Establish farmers' feedback mechanisms to cooperative members on possibility of having sub-clinical mastitis based on conductivity reading.
Women's groups	Community based organizations	Awareness on importance of GHP and techniques to control mastitis in dairy animals. Capacity building to farmers for mastitis control technologies (e.g., PMTD and DCI). Reagents provided to test the new technologies.
Animal Nutrition Division, NARC	Research	Laboratory glassware and chemicals provided for conducting feed resource analysis

Milk Producers Cooperative/ Women Farmers' Cooperative, Farmers Groups (7)	Farmers Organization	Tablets/ Laptops with loaded feeding support tool and nutrient content analysis of feeding resources
District Livestock Service Office, Arghakhandi	Government- Extension	Tablet/ Laptop with loaded feeding support tool and nutrient content analysis of feeding resources
Ethiopian Institute of Agricultural Research (EIAR)	Research	Discussion on the methods of conducting value chain analysis
Ethiopian Institute of Development Research (EDRI)	Research	Discussion on the methods of conducting value chain analysis
Mekelle University	University	Full-day workshop on adult learning principles
DLS offices	Government	Demonstration of necropsy techniques and discussions of disease control

## VIII) Innovation Transfer and Scaling Partnerships

### a) Plan of Action

Key components of the project's innovation transfer and scaling partnerships include the following:

- **Innovation Platforms:** These annual multi-stakeholder meetings in each target country are at the heart of the Livestock Systems Innovation Lab's impact pathway and innovation transfer and scaling partnerships. These meetings involve diverse stakeholders including the ministries, national agricultural research systems, universities, USAID-funded and other donor-funded projects, and the private sector. The first meeting of the Innovation Platform develops demand-driven priorities for the project in a participatory manner with stakeholders. In subsequent meetings, the stakeholders provide input on the progress of the research, and discuss transfer and scaling opportunities and plans.
- **Scaling plans:** Each project funded by the Feed the Future Innovation Lab for Livestock Systems develops a scaling plan, i.e., a plan that details the innovation, beneficiaries/users, target agroecologies, administrative areas or livestock systems, potential extension/dissemination approaches, policy implications and dimensions, knowledge products needed to effectively disseminate the innovation, and steps needed to ensure effective research to development bridging. These plans are initially developed by the research teams and reviewed and improved, where needed, during the Innovation Platforms. The Management Entity plans to support the implementation of the scaling plans, particularly after the research projects end, and evaluate their effectiveness.
- **Research partnerships:** The Requests for Application issued by the Livestock Systems Innovation Lab required that all research project teams include development or private sector partners to ensure that technology transfer and scaling efforts can be considered from the outset and developed.

### b) Steps taken

In FY 2017, Innovation Platform meetings were held in Niger (October 2016), Nepal (December 2016), Ethiopia and Rwanda (January 2017), and Cambodia (August 2017). Development of scaling plans will initiate in FY 2018, particularly among the short-term projects that end that year.

### c) Partnerships made

During FY 2017, Innovation Platforms and the criteria for forming consortia that responded to the RFAs, facilitated development of partnerships between research and development organizations. Pages 6-7 of this document list the development and private sector organizations that participated in the Reach and Focus projects in FY 2017.

In addition, several projects already made progress in innovation transfer and scaling partnerships, including:

- In Nepal, the project led by B. Shrestha from the Heifer International Nepal collaborated with Kisanka Lagi Unnat Biu-Bijan Karyakram (KUBK) (i.e., Improved Seed for Farmers), an IFAD-funded and Ministry of Agricultural Development-implemented project in Nepal. This focused on training participants in the use of the FAO balancing tool he has adapted to Nepalese conditions, as well as the Excel-based linear programmed least cost ration formulation software for dairy animals and goats he developed. The 18 participants involved Livestock Development Officers from the Department of Livestock Services and Technical Project Staff of KUBK.
- Also in Nepal, a Technical Coordination Committee (TCC) was established to ensure engagement of the government with the project led by C. Mullally of the University of Florida during its implementation. The committee will eventually determine whether the platform for CAHW training developed by the project will be incorporated into CAHW training for Nepal. This is an important first step for scaling up.

- In Ethiopia, the project led by W. Smith of the UC-Davis closely collaborated with the government of Ethiopia to ensure that the research serves the Government's efforts to better understand and design effective interventions to control and prevent young-stock mortality.
- Also in Ethiopia, the project led by PI B. Minten closely collaborated on the analysis of ASF prices and on communicating the results, with the ESSP, a local policy organization. The increasing price of nutritious foods was also identified by the team as a constraint for the Productive Safety Net Program (PSNP) to achieve the planned nutritional objectives in its fourth phase mid-term review.
- And finally in Ethiopia, the training of trainers to improve meat hygiene, safety, quality, preservation and value addition by J. Schleffler of UF (reported in Section Ve), paved the way for training of butchers by the USAID Value Chain Activity Project implemented by Fintrac in September-October 2017.

#### **d) Technologies ready to scale**

There are no technologies ready to scale. Data analysis is still ongoing for projects ending early in FY 2018.

#### **e) Technologies transferred**

No technologies have been transferred yet. For FY 2018, it is expected that 17 technologies or practices will be made available for transfer. As part of the interventions studies of the program, 650 farmers (303 women) applied improved technologies/practices in FY 2017. These were farmers reporting diseases to sentries who communicated them through a cell phone app.

#### **f) Technologies scaled**

No technologies have been scaled. Efforts to facilitate scaling are expected to initiate in FY 2018.

## **IX) Environmental Management and Mitigation Plan**

### **a) Report on mitigation and monitoring activities in relation to the EMMP**

Several projects faced challenges in identifying appropriate certified laboratories for their analyses, particularly those involving infectious agents. Projects implemented environmental mitigation and monitoring plans from the outset but some changed their research plans, which necessitated modification or elimination of some of their EMMPs. Throughout FY 2017, the Livestock Systems Innovation Lab provided extensive coaching and support to the subawardees on preparation and adherence to EMMPs. In addition, in Q4 as part of a larger mission that focused on evaluations and data quality, environmental monitoring was conducted by the Livestock Systems Innovation Lab's East Africa Regional Coordinator and Monitoring and Evaluation Specialist for projects in Ethiopia and Rwanda. A brief summary of the pertinent issues is given below.

#### **b) BSL compliance**

Several projects require biosafety level 2 (BSL 2) facilities, which is not commonly available in the target countries. Solutions included the following:

- The project led by Dr. Kebede Amenu from Addis Ababa University will conduct the microbiological analysis on *Escherichia coli* O157:H7, *Staphylococcus aureus* and *Salmonella* spp at ILRI's BSL 2 Lab. Further molecular characterization of bacterial isolates will be carried out at the University of Tennessee's BSL2 lab. Lab protocols for this work will be reviewed and approved by the ILRI Institutional Biosafety Committee and then by USAID prior to initiation of lab work. In the field lab in Yabello, only the basic milk hygiene indicator tests (total bacterial count and coliform counts) will be conducted, therefore BSL2 labs are not needed.

- The University of Florida Environmental Health and Safety office reviewed and approved (July 17) the protocols for the project led by Dr. Keshav Sah from Heifer International Nepal, which includes isolation of unknown Risk Group 2 bacteria (*Streptococcus pyogenes*, *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus uberis*, *Streptococcus agalactiae*, *Klebsiella pneumoniae*, etc.). These protocols were then reviewed and approved by the Bureau Environmental Officer at USAID (July 19) before the lab work began.
- The Kansas State University Research Compliance Office approved the BSL 2 protocols of the project led by Dr. Jessie Vipham that involves laboratory research on infectious diseases and microbial and fungal contamination of animal source foods at Hawassa University. This included the development of written protocols and procedures submitted to the Institutional Biosafety Committee which were approved first by KSU (August 29) and then by USAID (September 21). Developing the protocols allowed the project to identify some gaps, particularly in regard to the availability of biosafety waste supplies, and the project will take action to ensure that the appropriate supplies are in place in the lab prior to the commencement of activities.
- The project lead by Dr. Woutrina Smith from UC-Davis on identifying and controlling causes of youngstock mortality in Ethiopia had its BSL 2 protocols approved (July 28) by the Environmental Health and Safety Office at UC-Davis. These protocols included (1) basic laboratory safety, (2) biosafety and personal protective equipment (PPE), (3) implementing cold chain for safe sample transport, (4) *E. coli* procedures, (procedures for *Salmonella*, and (6) procedures for fecal and parasites. Approval from the Environmental Officer at USAID was received on October 10.
- The project led by Jean Baptiste Ndahetuye from the University of Rwanda developed standard operating procedures (SOPs) for lab protocols and a biosafety plan for the enumeration of *Escherichia coli* and detection of *Brucella* spp., *Campylocater* spp., *Salmonellae* spp., *Staphylococcus aureus* in raw milk samples collected from individual dairy cows from farm bulk milk in Rwanda. Approval of these protocols was the delayed, as the first biosafety plan submitted to USAID (September 18) did not mention various biosafety actions that would be necessary to safely conduct the BSL 2 laboratory analysis. The project's partners at the National Veterinary Institute in Sweden revised and approved (October 12) the revised protocols and approval from USAID was received on November 2.
- In addition to Dr. Amenu, two other projects have yet to submit their laboratory certificates or institutional approved protocols. These projects, both of which are multi-year Reach projects, are the following: (1) the project led by Dr. Delia Grace in Cambodia, and (2) the project led by Dr. Emily Ouma in Rwanda. Their BSL 2 activities are anticipated to start in FY 2018.
- The PPR VAA team started working with Makerere University to obtain copies of the BSL certificates of their College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB) laboratory. A scheduled visit of the lead researcher to the lab in June 2017 had to be cancelled due to unforeseen circumstances. The visit is now scheduled for Q2 FY2018 and when it occurs, standard operating procedures will also be discussed and finalized. A lab assessment will be conducted for Makerere University in Quarter 2, FY 2018 prior to the initiation of any lab activities.

### c) Monitoring and Mitigation conducted

Projects that conducted research activities in FY 2017 implemented diverse mitigation activities as well as monitoring to ensure that mitigation measures included in their EMMP were adequate. Some PIs provided suggestions on improvements in laboratory practices for the analyses conducted. The list below is not complete, however, but it highlights the actions taken by those projects that completed activities listed in their EMMPs in FY 2017. Examples of such mitigation and monitoring procedures include the following:

- PI, Bhola Shrestha: Monitoring of feed sample collection, packaging, labeling and transport was conducted by the Chief of Animal Nutrition Division and the lab in-charge. Refresher training was given to lab technicians on potential environmental impacts and biosafety including safe handling of materials

as well as their storage, treatment, disposal and good hygiene and monitoring of proper disposal of waste generated. Samples were collected as per standard protocol of Animal Nutrition Division, and packaging, labeling and adherence to transportation regulations and appropriate courses of action for spills, injury and exposure were applied.

- PI, Keshav Sah: Monitoring was conducted by Co-PIs Rima Devi Shrestha (HICAST) and Krishnaraj Pandey (Regional Veterinary Laboratory; RVL). Assessment of knowledge of PPE training was provided, as well as assessment of laboratory work procedures and waste management, monitoring of personnel working in the lab, or collecting or transporting samples. Shrestha monitored samples collected by technicians, and observed that samples were collected in sterilized bottles directly from the teat, labelled properly, and transported in a coolbox with icepack. Thereafter, samples were transported to the RVL Surkhet in the coolbox with ice. Additionally, it was assured that a responsible person for each laboratory was identified who checks the sample ID and documentation. Pandey monitored adherence to the microbiology SOP in and out of the laboratory and appropriate media sterilization techniques. This same individual ensured proper treatment of liquid waste from the lab.
- PI, Deon van der Merwe: Training sessions on good laboratory practices given to staff of the three labs. A practical component was included where staff were observed on PPE use. During lab analysis, lab coats, eye protection, and gloves were worn. Training also covered use of the lateral flow analytical method and transport of materials.
- PI, Jean Baptiste Ndahetuye: The PI has been trained in sampling and analysis, and a training certificate is on file. Biosafety training was given to project personnel at the beginning of sample collection and analysis. The training covered wearing gloves and lab coats during sample handling and analysis in the laboratory, disinfecting equipment/benches before and after use, and washing hands after samples handling, among others. Biosafety guidelines were provided to project personnel, and all individuals signed a document indicating that they read and understood the protocols. The PI observed the use of gloves, lab coats, and decontaminates during samples analysis. Furthermore, the PI ensured that materials and equipment needed to fulfil biosafety conditions were stocked. This included buying PPE, alcohol and hand disinfectant for disinfection, and autoclave functioning, among others.
- PI, Dirk Maier: Monitoring was conducted by the project Co-PI, Mr. Nishimwe. Training was provided on mycotoxin analysis, sampling techniques, and lab safety to the UR collaborators and students working on the project. These trainings included sample handling and analysis and waste disposal. SOPs for all steps of sample preparation and analysis were developed and discussed with students. Mr. Nishimwe visually observed the execution of procedures for handling, preparation, storage, and analysis of samples and ensured that PPE was worn during sample grinding and analysis and that fume hoods were used.

Some PIs noted that it was difficult to monitor or consistently monitor the work since they could only visit the target countries a few times a year. They were advised to ensure their target-country-based Co-PIs and collaborators provide the necessary oversight. There was an additional concern about the cost associated with monitoring for environmental compliance. The Livestock Systems Innovation Lab has provided guidance to these PIs about ways to conduct monitoring with little additional costs, has encouraged new RFA applicants to include monitoring costs in their budgets, and has further encouraged the projects to integrate monitoring in their routine project activities.

(1) Changes to or delays in research plans that eliminated the need for environmental mitigation  
Several research projects revised activities or experienced delays that eliminated the need for environmental mitigation for specific activities. These include:

- PI, Corrie Brown cancelled her plans to include a practical session that involved euthanizing sick animals for necropsies and disposal of animal carcasses. The trainings described how to protect against zoonotic disease, including segregation of sick animals, careful washing of hands, and

changing clothes after being around a sick animal, but did not involve working with live animals or contact with their body fluids.

- PI, Conner Mullally's research trials with forages were delayed to FY 2018.
- PI, Woutrina Smith's and Kebede Amenu's laboratory analyses of disease agents were delayed to FY 2018.

(2) Coaching, support, and monitoring provided by the Management Entity

To support the environmental monitoring efforts of the subawardees, during the monitoring visit in July, the Livestock Systems Innovation Lab monitored projects that had initiated the activities outlined in their EMMPs. Main issues identified during this visit are outlined below:

- PI, Jean Baptiste: Precautions are taken during sample collection and, in addition to wearing overalls, each collector carries a backpack that contains gloves, paper towels, alcohol diluted by 70%, and a set of tubes. They wear this PPE for all levels of sample collection. The PI recognized that, ideally, they would wear the black work boots as well, but he said that they make it hard to climb the mountains, so they often wear sneakers or closed toed shoes instead. They do wear the work boots in the lab.
- PI, Dirk Maier: During his lab visit, the recent graduates involved with the project were grinding feed samples. All personnel wore lab coats, gloves, and eye goggles. While the SOPs indicate that a mask (N95) should be worn during grinding, this was not observed. All samples were labeled and stored separately. The lab was clean and adequate with a proper waste disposal system.
- PI, Deon van der Merwe: When collecting feed samples, PPE (such as gloves) was not worn. However, according to the in-country collaborator, the team does wear protection and safety clothes during feed analysis. After collecting the samples, they were then put in sample bags and labelled. It was observed that lab personnel wore and had an adequate supply of PPE. The lab facilities at the lab visited were appropriate, had clean surfaces, and good disposal systems, hand and eye washing units, and procedures.
- PI, Jessie Vipham: The project planted forages on two plots of land in February and July 2017, both of which are less than two hectares. At the farmer level, no more than one quarter of a hectare per farmer will be used. None of the plots were fenced in. No pesticides or insecticides were used. Urea is used at about 100kg of fertilizer per hectare (50 kg each for two separate applications). To manually apply the urea, they open the soil and place the fertilizer, using one glove and no mask. The Co-PI indicated that this is the application method that should be applied, however, it was mentioned that resources are sometimes limited and that they sometimes do not use gloves. At the time of these monitoring efforts, urea had been applied to 1,620 square meters of land. The Co-PI monitors the application process with the help of field assistants.
- PI, Corrie Brown: Biosecurity was one part of the training given to farmers and professional veterinarians. During the training, the project's specimen collection manual was also discussed for half a day. The manual was designed to be a reference to help the beneficiaries remember how to collect and transport specimens. Biosafety measures retained by participants was consistent across the group interviews conducted. Some of the preventative methods (new at least to producers interviewed) involved learning how to isolate healthy from sick animals, and instructions that they should not to have direct contact with sick animals. Participants were told that if they identified very contagious diseases, they should not contact body fluids of the animals and they should change their clothes after contact with sick animals. However, many participant said that while this was part of the training, practically that was not being done. They were also trained on hygiene such as washing tools and hands and not physically examining sick animals.

- The practices for the disposal of waste differed. For example, one veterinarian said he buries gloves or other waste generated after use but needles are packed in a bag after placed in small individual boxes for disposal.
- Use of gloves for sample collection by veterinarians did not seem consistent. Throughout FY 2017, the Management Entity provided extensive, individualized coaching and support to the subawardees on development and implementation of EMMPs. Areas of advice, coaching and support included explaining why EMMPs are needed, discussing and problem solving issues related to BSL 2 compliance, providing advice on suitable mitigation measures for particular activities, discussing what these measures mean under field conditions, and explaining how monitoring can be conducted by different individuals in the research project. In general, both the development and implementation of EMMPs in target countries were regarded as a challenge and the Management Entity plans to continue to support the subawardees in this area to ensure compliance. Part of the support provided during FY 2017 involved creating an environmental monitoring template for the projects to fill in after each monitoring visit. During FY 2018, the Management Entity plans to develop short, easy-to-understand guidelines for environmental monitoring and mitigation. Furthermore, the Regional/Country Coordinators are going through training on environmental monitoring and mitigation. These coordinators will be central to coaching and providing support to the subawardees during routine activity visits.

## X) Open Data Management Plan

Seven projects revised their Open Data Plans in October 2017 to delay the dataset target submission date due to slow project startups and/or need for additional time for research activities, resulting in no-cost extensions to their projects. Due to these revisions, no datasets are scheduled to submit to USAID's Data Development Clearing House in FY 2017. A number of datasets, however, will be submitted in FY 2018.

Reports from various non-competitive activities conducted in early to mid FY 2017 were completed in FY 2017 and shared with the USAID Missions; those completed late in FY 2017 will be submitted in FY 2018. All reports will be submitted to the USAID Development Experience Clearinghouse (DEC) in Quarter 2, FY 2018. Except for the study by Wilfong and McKune, the non-competitive activities were brief, qualitative assessments and did not therefore result in data covered by USAID Open Data Policy. The small dataset from the study by Wilfong and McKune will be submitted to the DEC in FY 2018, Quarter 2.

## XI) Governance and Management Entity Activity

During FY 2017, the Management Entity continued to provide leadership, management, and coordination functions for the Livestock Systems Innovation Lab. Some of the main leadership activities include the following:

- Organization of the first Global Nutrition Symposium in March 29-30, 2017, in Gainesville, Florida, with the theme, "Nurturing development: Improving human nutrition with animal-source foods." The symposium brought together leading experts in human nutrition and production of animal-source foods, representatives of all subaward projects, as well as representatives of donor and development organizations. All presentations were posted on the symposium's website and the proceedings of the Global Nutrition Symposium as well as a peer reviewed paper and a video will be published in early FY 2018. The important role of ASF in human nutrition continued to be researched, emphasized, and communicated in the program activities throughout the year.



- Organization of the first Annual General Meeting, in Gainesville, Florida, during the week of March 27. Almost all Principal Investigators attended this event which involved an in-depth introduction to the Livestock Systems Innovation Lab, as well as presentations and discussions on Monitoring and Evaluation, Environmental Monitoring and Mitigation, communication, and administrative, financial, and compliance issues. The Global Nutrition Symposium took place on Wednesday-Thursday, and on Friday, the group visited University of Florida facilities. A short mid-week visit to the nearby Paynes Prairie park with the theme “Introducing Alligators” provided insights about the local environment and fostered camaraderie.
- Development of an evaluation framework for the program and initiation of evaluation activities in Ethiopia and Rwanda in July-August 2017. The evaluation framework covers the research, dissemination, and impact phases of the technologies. The FY 2017 field evaluation focused mainly on the Focus projects, which are ending in FY 2018, and investigated the research for development process of each project by assessing the relevance and characteristics of each innovation that will be disseminated in the future.
- Initiation of a framework for adding value to the ongoing research portfolio, through diverse activities led and coordinated by the Management Entity, including effective communication about research results, fostering learning communities through cross-project thematic efforts, and supporting scaling up efforts, among others.

The Management Entity also continued to manage core functions including the following:

- Administration and finance: Support to the subawardees on finalizing their technical narratives and budgets prior to contracting, and continued support during research project implementation and monitoring, including reviewing performance reports and invoices, revisions of budgets and subaward agreements, and the provision of necessary subaward management trainings
- Compliance: Support to subawardees on compliance, including restricted commodities, procurement, participant support, export controls, environmental and research compliance.
- Human Resources: The Management Entity finalized staffing for the Gainesville office by hiring a Communications Specialist. The East Africa Regional Coordinator was hired and interviews for the Regional Coordinator position in Asia and the Country Coordinator positions for Burkina Faso and Niger were conducted, and candidates were selected. Those recruited are expected to start work in Q1 FY 2018.
- Communications: Active communication and updates on the project and Agrilinks’ websites resulted in 14,546 and 305 website visits, respectively. Facebook (134) and Twitter (476) posts resulted in 812 Facebook likes and 258 Twitter followers. The first edition of *Lively*, the quarterly newsletter of the Livestock Systems Innovation Lab, was released in August, and the PPR Associate Award was featured in an article published by National Public Radio on August 6. Two trainings/webinars and information sharing events for subawardees were held at UF including the Global Nutrition Symposium and a seminar given by Jeff Mariner on Rinderpest Eradication (December 2016). The Management Entity also gave five conference or symposia presentations, one by S. Hendricks at the International Food and Agribusiness Association Conference (June 2017), one by M. Eilitta at the KSU crop-livestock conference (January 2017), and three by A. Adesogan at the International Livestock Congress, Houston (March 2017), the Global Nutrition Symposium (March 2017) and the Feed the Future Innovation Lab West Africa Regional Partners Meeting, (February 2017). Since research activities are still ongoing, no peer-reviewed publications have been produced. Presentations on the work of the Livestock Systems Innovation Lab were also given to the World Health Organization (OIE; April 2017), University of Reading (December 2017), Executive Board of SSAFE (March 2017), Makerere University Uganda (April 2017), Kenya Agriculture and Livestock Research Organization (September 2017), Ministry of

Agriculture Animal Industries and Fisheries-Uganda (April 2017), Ministry of Agriculture, Livestock and Fisheries-Kenya (September 2017), and Kenya Veterinary Vaccines Institute (September 2017).

- Monitoring and Environmental Mitigation and Monitoring: Active support and coaching was provided to subawardees, see above (section IX).
- Responding to funding opportunities: These included submission a concept note and proposal to the BMGF and a concept note to USAID Nigeria.

Finally, the Management Entity continued to coordinate the functioning of the wider Livestock Systems Innovation Lab. Highlights included:

- Convening of quarterly External Advisory Board (EAB) meetings and provision of additional updates to the Board, as well as organizing Internal Advisory Committee (IAC) meetings. Four of these latter meetings per year were planned but two were held due to challenges with finding times when all members could participate. Given the regular convening of the EAB and the fact that two of the four IAC members are intimately engaged and familiar with the activities of the Innovation Lab, the less frequent meetings of the IAC is not considered a problem.
- Conduct biweekly faculty meetings. These meetings have been held regularly to present and discuss planned and conducted activities, and to solicit faculty feedback on various topics.
- Conduct annual Innovation Platform meetings in all target countries: Five meetings were held in FY 2017, one in each of the following countries: Niger, Ethiopia, Rwanda, Cambodia, and Nepal. An Innovation Platform meeting was not held in Burkina Faso as the prioritization meeting was held in FY 2016, and the next one is scheduled for early FY 2018.

## XII) Other Topics

No other topics to report.

## XIII) Issues

No other issues to report.

## XIV) Future Directions

The Feed the Future Innovation Lab for Livestock Systems looks forward to numerous exciting events and activities in FY 2018. Some of these include the following:

- Initiation of added value activities, through greater cross-project linkages, increased communication, and focus on scaling up, including through project scaling plans.
- Initiation of the BMGF-funded project on feed and environmental enteric dysfunction in Ethiopia and Burkina Faso.
- The second annual Global Nutrition Symposium, entitled “The Missing Link: Increasing Availability of Animal-source Foods Through Greater Production and Marketing of Quality Feeds,” to be held in Addis Ababa, Ethiopia on January 24-25, as part of the Annual General Meeting.
- Conduct of a baseline study and initiation of vaccination efforts in Uganda and Kenya, as part of the PPR VAA Associate Award project.
- Publishing of a mini-RFA for UF faculty and project subawardees to complement the ongoing portfolio, and initiation of Strategic Partnership activities.

- Initiation of Future Systems, Nutrition, Gender and Policy non-competitive activities in the target countries.

# Appendices

## a) List of Awards Given to Partners

Project Name	Lead Institution	Grant Type	Country	Project Start Date	Project End Date	Project Budget
<b>U.S. Institutions</b>						
Designing and Evaluating Innovations for Development of Smallholder Female Livestock Cooperatives in Nepal	UF (PI: Mullally)	REACH	Nepal	17-Oct-16	30-Sep-20	\$ 1,233,989.00
Linking cattle nutrition to human nutrition: A value chain approach to improving the production, handling, and consumption of animal source foods in Ethiopia	KSU (PI: Vipham)	REACH	Ethiopia	17-Oct-16	30-Sep-20	\$ 1,038,237.00
Improving the evidence and policies for better performing livestock systems in Ethiopia	IFPRI (PI: Minten)	REACH	Ethiopia	17-Oct-16	30-Sep-19	\$ 667,067.00
Addressing Young Stock Mortality in Smallholder Farms and Pastoral Herds of Ethiopia	UC-Davis (PI: Smith)	REACH	Ethiopia	17-Oct-16	16-Oct-19	\$ 599,851.00
Assessment and Mitigation of Aflatoxin and Fumonisin Contamination in Animal Feeds in Rwanda	Iowa State University (PI: Maier)	FOCUS	Rwanda	10-Dec-16	31-Mar-18	\$ 151,784.00
Improved pig health and nutrition: the major drivers of profitability and sustainability for Smallholder farmers in Cambodia	KSU (PI: Tokach)	FOCUS	Cambodia	17-Jul-17	16-Jul-17	\$ 150,000.00
Improving Dairy Animal Productivity and Income of Dairy Farmers through Effective Control of Mastitis Disease	Heifer International (PI: Sah)	FOCUS	Nepal	1-Oct-16	2-Feb-18	\$ 129,142.00
Feeding Support Tool Development for Enhancing Dairy Animal Productivity for Improved Livelihood of Smallholder Dairy Farmers in Nepal	Heifer International (PI: Shrestha)	FOCUS	Nepal	1-Oct-16	2-Feb-18	\$ 129,591.00
Living fences for improved livestock feed in Cambodian smallholder systems	University of Tennessee Institute of Agriculture (PI: Gill)	FOCUS	Cambodia	10-Jun-17	9-Jun-18	\$ 125,827.00
Mycotoxin Prevalence and Mitigation Measures in Ethiopia	KSU (PI: Van Der Merwe)	FOCUS	Ethiopia	1-Nov-16	31-Dec-17	\$ 107,469.00
Empowerment of Village Women for Detection and Control of Livestock Diseases in Nepal	Colorado State University (PI: Bowen)	FOCUS	Nepal	1-Oct-16	31-Jan-18	\$ 99,954.00
The Effect of Passive Surveillance Training on Animal Health Parameters, Northern Ethiopia	University of Georgia (PI: Brown)	FOCUS	Ethiopia	1-Oct-16	31-Jan-18	\$ 98,348.00

Strengthening Human and Institutional Capacity Development in Livestock Innovation Laboratory Partner Institutions	UF (PI: Russo)	NCA*	All	14-Jun-17	30-Sep-20	\$ 430,645.00
<b>Non-U.S. Institutions</b>						
Enhancing milk quality and consumption for improved income and nutrition in Rwanda	ILRI (PI: Ouma)	REACH	Rwanda	1-Jan-17	31-Dec-19	\$ 1,104,578.36
Safe Food, Fair Food for Cambodia	ILRI (PI: Grace)	REACH	Cambodia	20-Jul-17	19-Jul-20	\$ 774,717.71
Improving handling practices and microbiological safety of milk and milk products in Borana pastoral communities, Ethiopia	ILRI/Addis Ababa University (Alonso/Ejeta)	FOCUS	Ethiopia	1-Nov-16	31-May-18	\$ 125,316.36
Milk production practices, udder health and their impact on milk quality, safety and processability in Rwanda	UR (PI: Ndahetuye)	FOCUS	Rwanda	17-Oct-16	31-Mar-18	\$ 102,350.00

\*NCA= *Non-competitive activity*

## b) Success stories

### i) Farmers in Nepal Learn to Fight Hidden Disease

You can't change what you can't perceive. Dairy farmers in Nepal learned this year about an invisible enemy that has been robbing them of potential profits, and now they are changing their habits and practices to prevent its return.

The invisible enemy affects the udder of cows and buffaloes often sub-clinically, or without external cues. "The farmers have never heard of sub-clinical mastitis. They say, "Our animals are suffering and we didn't know about it," said Dr. Keshav Prasad Sah, a senior program manager with Heifer International, Nepal. He is leading a year-long research and capacity building project funded by the Feed the Future Innovation Lab for Livestock Systems, titled [Improving Dairy Animal Productivity and Income Of Dairy Farmers through Effective Control of Mastitis Disease](#).

A bacterial infection of the udder, mastitis, reduces the amount of milk produced and contaminates it. This year's project discovered infection rates of 80 percent at the 200 farms investigated across Surkhet, Bardiya, Banke and Dang districts, whereas previous research ranked it as low as 14 percent. To raise awareness at small farms, Dr. Sah's team tested milk and developed training materials for mastitis, and then taught good animal husbandry and milk management practices to more than 200 farmers and animal health workers. Begun in March 2017, the trainings are showing promise.

One participant, Bhuwan Rijal, 49, a livestock technician from western Nepal, has increased his income from dairy five-fold, said Dr. Sah. Previously, Rijal earned US \$48 per month from selling the milk from one cow and one buffalo. His family of seven retained two liters of milk daily; the remaining four were sold. Then on March 7, Rijal joined 25 other technicians for a training on good husbandry practices. "He didn't have any idea about sub-clinical mastitis," said Dr. Sah. "The training motivated him, and he understood that on his farm, mastitis was a managerial problem." Rijal cleaned up his act and improved the way he kept, milked and housed his animals. He acquired two more cows, increasing production from 6 to 30 liters per day. His income from dairy has risen to US\$211 per month.

In June, after learning from Dr. Sah's team, more than a dozen trainers fanned out across four districts of mid-western Nepal. They shared their new knowledge and motivation in structured sessions with 219 farmers, mainly women. By the time the project ends in January 2018, Dr. Sah hopes to have reached 400 farmers.

Training is just one of five objectives of the project (see all at <http://livestocklab.ifas.ufl.edu/what-we-do/dr-keshav-prasad-sah/>). These initial research successes are limited to a small portion of Nepal's extensive dairy sector, which represents the majority of livestock's contribution to GDP. At least 500,000 households in Nepal produce dairy products. In the coming year, Dr. Sah's project will generate further evidence on the efficacy of various interventions so that their potential for reducing mastitis in Nepal can be quantitatively assessed.



*Bhuvan Rijal stands in his upgraded livestock shed, where he implements best management practices for milk mastitis disease control. (credit: Keshav Prasad Sah)*



*A trainer instructs dairy farmers in Jamuni village, near southwestern Nepal's border with India. (credit: Prerana Karki).*

## ii) Innovation Platform Method Fosters Engagement and Consensus in Setting Research Priorities



*Stakeholders gathered in Ethiopia for an Innovation Platform meeting in January 2017.*

How do grant-awarding entities choose their research priorities, which then turn into funding opportunities? Add the need to engage stakeholders from six countries on two continents, and the task seems colossal. The solution: Ask the experts in each country to be your guide. That's the approach of the Feed the Future Innovation Lab for Livestock Systems and their Innovation Platforms. Feed the Future Innovation Lab for Livestock Systems is a USAID-funded project that aims to improve human health, nutrition, and incomes through improved technologies, practices and policy support. The Innovation Platforms are annual, structured stakeholder gatherings.

Previous gatherings enabled livestock sector stakeholders in Ethiopia, Rwanda, Nepal, Cambodia, Burkina Faso and Niger to debate, list and rank research priorities, based on the highest needs. These stakeholders include representatives of the government, research, extension and educational organizations, the private sector, producer organizations, USAID, and other development projects.

Some common priorities emerged across continents, while others were country-specific. All six countries agreed on two priorities: 1) increasing the quantity and quality of livestock feed, and 2) control of transboundary animal diseases. Creating stakeholder engagement in collaborative, multi-year research projects is vital for development success. The project's Innovation Platforms do this in three distinct stages. In year one, stakeholders gather in their nation's capital to generate priorities for research. In the next year—after projects have been selected based on those country-specific priorities—researchers share project plans with attendees, who become project mentors. In subsequent years, the community continues to track and support the research projects, including discussing scaling up of their findings.

Leaders from the Feed the Future Innovation Lab for Livestock Systems did not arrive empty-handed at the first Innovation Platform. They shared literature reviews and proposed draft priorities, drawing upon previous in-country visits. Discussion and debate led to an agreement on final priorities after only two days. All priorities received an additional level of stakeholder engagement through reviews by Ministries of Livestock or Agriculture.



The first, priority setting Innovation Platform meetings in FY 2016-2017 connected with 340 stakeholders, representing 184 organizations. The second meetings in Nepal, Rwanda, Ethiopia and Cambodia in FY 2017 alone included 130 participants from 68 organizations.

The priorities developed, although a significant investment of time and effort, truly reflect stakeholder consensus on the most important, researchable issues in the animal-source food value chains for each country. They therefore continue to be valuable for the Feed the Future Innovation Lab for Livestock Systems as it strives to expand its reach and depth. As these priorities are communicated more widely, we expect that their value will extend beyond this Lab, and inform prioritization and planning of other initiatives.