FEED THE FUTURE INNOVATION LAB FOR LIVESTOCK SYSTEMS

ANNUAL REPORT (FY 2023)

OCTOBER 2023

Cover photo: M. Dione, Burkina Faso

FEED THE FUTURE INNOVATION LAB

FOR LIVESTOCK SYSTEMS

ANNUAL REPORT
Fiscal Year 2023

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Management Entity Information

At the end of Fiscal Year (FY) 2023, the Feed the Future Innovation Lab for Livestock Systems Management Entity (ME) core team consisted of 9 full-time and 5 part-time staff, and 11 faculty members who 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, 2023

Name	Position
Dr. Geoffrey Dahl	Director
Saskia Hendrickx	Associate Director
Dr. Adegbola Adesogan	Director, Strategic Partnerships
Andrea Bohn	Project Manager
Alicia Martinez Estrada	Research Coordinator III [1]
Dr. Erica Odera	Monitoring & Evaluation and Impact Specialist
Vacant	Marketing & Communications Specialist [2]
Nicole Monval	Fiscal Assistant III
William Fields	Fiscal Assistant II
Dr. Isidore Gnanda	Country Coordinator, Burkina Faso (part-time)[3]
Dr. Zeleke Mekuriaw	Country Coordinator, Ethiopia (part-time)[3]
Varijakshapanicker Padmakumar	Country Coordinator, Nepal (part-time)[3]
Dr. Moctar Karimou	Country Coordinator, Niger (part-time)[3]
Felix Ngamije	Country Coordinator, Rwanda (part-time)[3]

Notes: [1] A. Martinez joined on April 21, 2023; [2] J. Harper left in April 2023 and the position is currently vacant. [3] Employed by ILRI. All other core staff listed are with the University of Florida.

Table 2: Management Entity Faculty Members, as of September 30, 2023

Name	Position
Dr. Adegbola Adesogan	Co-leader, Livestock Production & Disease Management AOI
Dr. Jorge Hernandez	Co-leader, Livestock Production & Disease Management AOI
Dr. Arie Havelaar	Co-leader, Human Health, Food Safety, Diets & Nutrition AOI
Dr. Sarah McKune	Co-leader, Human Health, Food Safety, Diets & Nutrition AOI
Dr. Conner Mullally	Leader, Markets & Innovation Translation AOI
Dr. Nargiza Ludgate[1]	Leader, Local Capacity Development (LCD) CCT
Dr. Kathleen Colverson	Leader, Gender & Youth CCT
Dr. Greg Kiker	Leader, Future Livestock Systems & Resilience CCT
Dr. Renata Serra	Leader, Enabling Environment CCT
Dr. Sebastian Galindo	Technical Monitoring & Evaluation Supervisor

[1] The other LCD co-lead, Dr. Sandra Russo, retired in May 2023.

Technical and/or Advisory Committee Information

Internal Advisory Committee (IAC)

Table 3: IAC Members, Positions, and Departments, as of September 30, 2023

Name	Position
Dr. Glenn Morris, Jr.	Director, University of Florida (UF) Emerging Pathogens Institute
Dr. Samira Daroub	Professor and Director, UF Everglades Research & Education Center
Dr. Marta Wayne[1]	Dean of the International Center and Associate Provost, UF
Dr. Terry Moore[2]	Director of Research Administration, UF Institute for Food and Agricultural Sciences, IFAS

[1] Replaces Dr. Sandra Russo, who retired in May 2023; [2]Replaces Dr. Geoffrey Dahl, who became LSIL Director in February 2023.

External Advisory Board (EAB)

Table 4: EAB Members, Positions, and Organizations, as of September 30, 2023

| Name	Position and Organization
Dr. Michael Jacobs, Chair	Independent consultant – former Chief of Party, USAID PRIME project, Ethiopia
Ms. Ladd	Bureau for Humanitarian Assistance, USAID – former Senior Technical Director of Nutrition, ACDI/VOCA
Dr. Harinder Makkar	Independent consultant – former Senior Animal Production Officer, Food and Agriculture Organization of the United Nations (FAO)
Dr. Rob Readnour	Managing Director, Mountain Group Capital
Dr. Joyce Turk	Independent consultant – former Senior Livestock Advisor, USAID Bureau of Food Security
Dr. Iain Wright	Deputy Director General, Research and Development, International Livestock Research Institute (ILRI)
Donor representatives	
Dr. Tyrell Kahan	Livestock Advisor, USAID, Livestock Systems Innovation Lab Agreement Officer's Representative
Dr. Donald Nkrumah[1]	Program Officer, Bill & Melinda Gates Foundation

[1] Succeeds Ms. Kristen MacNaughtan, who took on another position at the Foundation in May 2023.

List of Target Countries

Table 5: List of target countries with regions where research is being implemented

Region	Countries	Provinces or regions
Americas	Haiti	Les Cayes & Cape Haitian
Asia	Nepal	(none in FY 2023)
East Africa	Rwanda	Eastern (Bugesera, Gatsibo, Kayonza, Nyagatare, Rwamagana), Northern (Gicumbi, Musanze, Rulindo), Southern (Kamonyi, Huye, Nyanza), Western (Nyabihu, Rubavu) provinces, and Kigali City (Nyarugenge, Gasabo, Kicukiro).
	Ethiopia	Sidama Regional State, Central Ethiopia Regional State (Gurage and Hadiya zones), Oromia region
West Africa	Burkina Faso	Centre and Centre-Nord regions
	Niger	Tillabéri and Maradi regions

Figure 1: Overview of target countries and USAID projects active in FY 2023
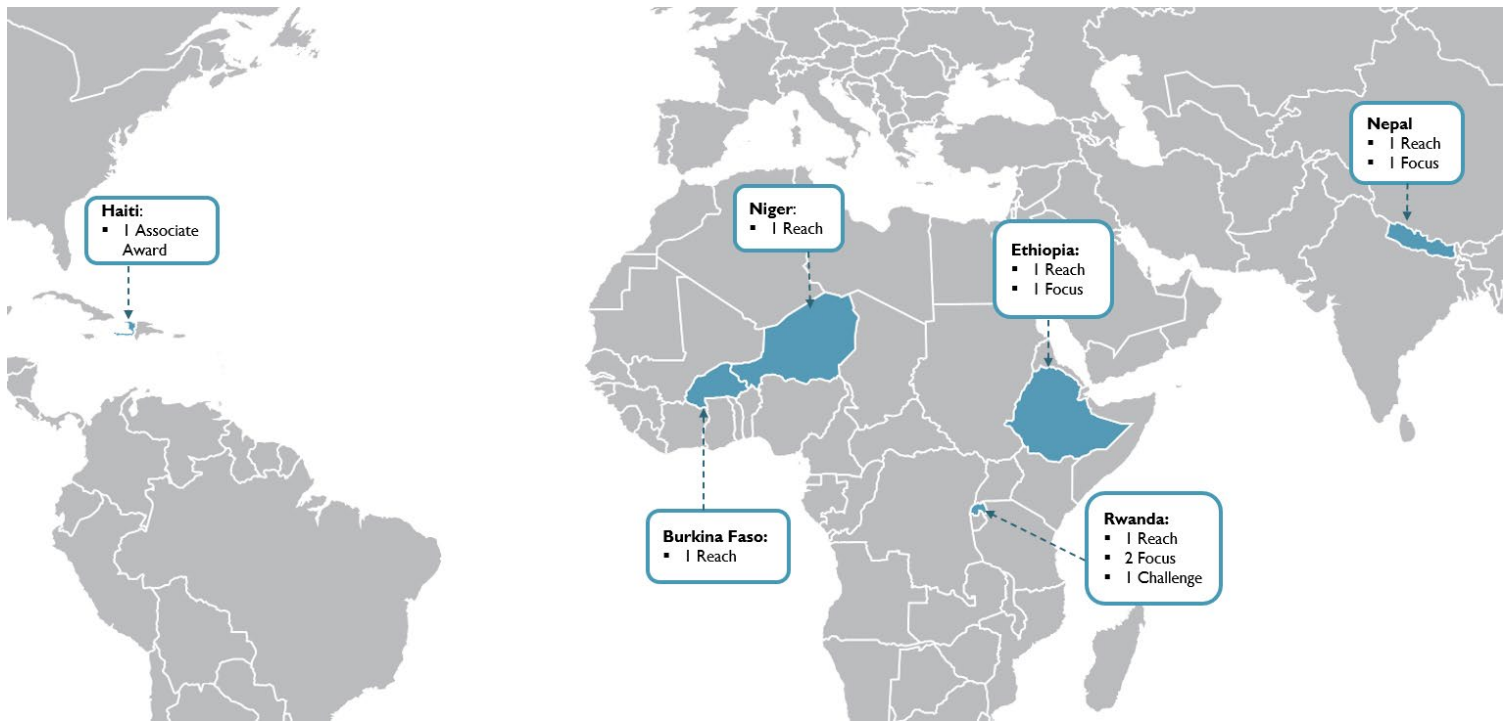
List of Program Partners

All countries' Ministries of Agriculture and/or Livestock, Ministries of Health, National Agricultural Research Institutes, and other related agencies are key partners of the Livestock Systems Innovation Lab (LSIL), even if they are not explicitly listed for each country as a project partner.

Donors
- United States Agency for International Development
- Bill & Melinda Gates Foundation

Implementing partners
- University of Florida
- International Livestock Research Institute

Burkina Faso
- Institute of Environmental and Agricultural Research (*Institut de l'Environnement et de Recherches Agricoles*)
- University of Joseph Ki-Zerbo, Ouagadougou *(Université de Joseph Ki-Zerbo, Ouagadougou)*

Ethiopia
- Addis Ababa University
- Ethiopia Public Health Institute
- Ethiopian Institute for Agricultural Research
- Haramaya University
- Hawassa University

Nepal
- Agriculture and Forestry University
- Forum for Rural Welfare and Agricultural Reform for Development
- Heifer Project Nepal
- Nepal Agricultural Research Council

Niger
- Abdou Moumouni University (*Université Abdou Moumouni de Niamey*)
- Amate Seed Farm
- Ainoma Seed Farm
- Association for the Promotion of Livestock Production in the Sahel and Savannah (*Association pour la Promotion de l'Elevage au Sahel et en Savanne*)
- Dan Dicko Dankoulodo University of Maradi (*Université Dan Dicko Dankoulodo de Maradi*)

Rwanda
- National Child Development Agency
- Rwanda Agriculture and Animal Resources Development Board
- Rwanda Biomedical Centre
- Rwanda Pig Farmers Association
- University of Rwanda

USA
- Arizona State University
- Boston Consultancy Group
- Cultivating New Frontiers in Agriculture
- International Food Policy Research Institute
- Land O'Lakes Venture37
- Mercy Corps
- Michigan State University

- North Carolina A&T State University
- North Carolina State University
- Syracuse University
- Texas A&M University
- The Ohio State University
- Tufts University
- University of California, Davis
- University of Georgia
- University of North Carolina - Chapel Hill
- United States Department of Agriculture
- United States Food and Drug Administration
- Washington University in St. Louis
- World Vision

Other International Partners
- Alliance Bioversity & CIAT, International Center for Tropical Agriculture (Bioversity/CIAT), Italy
- International Crops Research Institute for Semi-Arid Tropics, India
- Kyeema Foundation, Brisbane, Australia
- University of Liverpool, United Kingdom
- Te Kunenga ki Pūrehuroa Massey University, New Zealand

Acronyms

AAU	Addis Ababa University
AHS	Agricultural Household Survey
APEX	Agriculture Policy Environment eXtender
APESS	*Association pour la Promotion de l'Elevage au Sahel et en Savane*/ Association for the Promotion of Livestock Production in the Sahel and Savannah
APFS	Agro-pastoralist Field School
AOI	Area of Inquiry
ARSO	African Organization for Standardisation
ASF	Animal-source food
ASU	Arizona State University
AUC	African Union Commission
BCG	Boston Consulting Group
CAGED	Campylobacter Genomics and Environmental Enteric Dysfunction
CAHW	Community Animal Health Worker
CAVM	College of Agriculture, Animal Sciences and Veterinary Medicine
CCT	Cross-Cutting Theme
CERPP	*Centre d'Excellence Régional sur les Productions Pastorales: Viande, Lait, Cuirs et Peaux* / Regional Center of Excellence on Productions Pastorals: Milk, Meat, Leather and Skins
CGIAR	Consultative Group on International Agricultural Research
CIAT	Alliance Bioversity & CIAT, International Center for Tropical Agriculture
CLEM	Crop Livestock Enterprise Model
CNFA	Cultivating New Frontiers in Agriculture
CPAVI	*Centre de Promotion de l'Aviculture Villageoise* / Village Poultry Promotion Center
DDL	Data Development Library
dMCE	digital Mentoring and Continuing Education platform
DRARAH-CN	*Direction Régionale de l'Agriculture, des Ressources Animales et Halieutiques du Centre*/ Animal Resources and Fisheries of the North Central
EAB	External Advisory Board
EIAR	Ethiopian Institute of Agricultural Research
EISMV	*École Inter-Etats des Sciences et Médecine Vétérinaires de Dakar* / Interstate School of Veterinary Sciences and Medicine of Dakar Universities
EMMP	Environmental Management and Mitigation Plan
EPHI	Ethiopian Public Health Institute
FAO	Food and Agriculture Organization of the United Nations
FARMSIM	Farm Income and Nutrition Simulator
FORWARD	Forum for Rural Welfare and Agricultural Reform for Development
FY	Fiscal Year
GTAP	Global Trade Analysis Project
GHG	Greenhouse Gas
GIS	Geographic Information System
HIN	Heifer International Nepal
HPN	Heifer Project Nepal
i2i	Innovation to Impact
IAC	Internal Advisory Committee
IACUC	Institutional Animal Care and Use Committee
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDSS	Integrated Decision Support Systems
IET	Integrated Educational and Training
IFAS	Institute of Food and Agricultural Sciences
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
INERA	*Institute de l'Environnement et de Recherche Agricole* / Environmental and Agricultural Research Institute
IP	Innovation Platform
IRB	Institutional Review Board
J-PAL	Abdul Lateef Jamil Poverty Action Lab

KAP	Knowledge, Attitudes and Practices
LCD	Local Capacity Development
LSHTM	London School of Hygiene and Tropical Medicine
LSIL	Livestock Systems Innovation Lab
MCE	Mentoring and Continuing Education
MDP	Master of Development Practice
ME	Management Entity
MARAH	*Ministère de l'Agriculture, des Ressources Animales et Halieutiques* / Ministry of Agriculture, Animal Resources and Fisheries
MRC	Medical Research Council
NCDA	National Child Development Agency
NCE	No -cost extension
NDDB	National Dairy Development Board
NGO	Non-Governmental Organization
NEPAD	New Partnership for Africa's Development
NIRS	Near Infrared Spectroscopy
NISR	National Institute of Statistics of Rwanda
OHPC	One Health Poultry Champion
PACA	Partnership for Aflatoxin Control in Africa
PI	Principal Investigator
Q	Quarter (of a fiscal year)
RAB	Rwanda Agricultural and Animal Resources Development Board
RBC	Rwanda Biomedical Centre
RFA	Request for Applications
RPFA	Rwanda Pig Farmers Association
SMS	Short Message Service
SNNP	Southern Nations, Nationalities and Peoples' Region
SWAT	Soil and Water Assessment Tool
TAMU	Texas A&M University
UDDD	*Université Dan Dicko Dankoulodo de Maradi* / Dan Dicko Dankoulodo University of Maradi
UF	University of Florida
UR	University of Rwanda
USAID	United States Agency for International Development
VCC	Virtual Collection Center
VVE	Voluntary Village Extensionists
WEIA	Women Empowerment Index in Agriculture
ZATE	*Zone d'appui technique à l'élevage* / Livestock Technical Support Zone

Table of Contents

I.   Executive Summary

In Fiscal year (FY) 2023, Feed the Future Innovation Lab for Livestock Systems (LSIL) subaward project activities started gaining momentum once various agreements were in place. Field activities in Burkina Faso and Niger took place despite the deteriorating security situation in both countries. Commitment of the research teams and stakeholder engagement were key for this accomplishment. In FY 2023 LSIL affiliated researchers and staff completed 16 training courses, trained 277 people (131 male, 146 female), supported 16 students, and published 15 journal papers, 14 reports, and 31 additional publications. LSIL researchers and staff also gave 7 conference presentations and 35 seminars to share knowledge with other audiences. Three additional journal articles were identified which were published in FY 2022.

This fiscal year, LSIL worked with 820 program participants (48% male, 52% female). Of these participants there were 616 smallholder producers, 122 civil society members, 60 government workers, and 22 private sector representatives. A total of 16 students (8 male, 8 female) were supported through various projects in FY 2023. Of these, 1 is enrolled in a Bachelor level degree program, 10 in MS programs, and 5 in PhD programs. Of the 9 new/adapted technologies or practices, 6 were in the first innovation phase (under research) and 3 in the second phase (under field testing).

In Q3 and Q4, the LSIL Management Entity (ME) hosted 3 Innovation Platform meetings. As of September 30, 2023, 10 projects, 5 long term, 4 short term, and the challenge project in Rwanda have started activities. Registration on SAM.gov remained a problem for some organizations while the development of Standard Operating Procedures for fixed amount agreements at UF delayed the issuance of the 7 local capacity development projects.

The project website (http://livestocklab.ifas.ufl.edu) is updated regularly. It provides access to more than 90 videos of mostly research presentations; 89 of these are also available through the Lab's YouTube channel. The Resources tab links to pages outlining information on journal articles, countries, infographics, innovations, newsletters, podcasts, themes, and videos. In Q4 the success stories shared through the previous Annual Reports were published as blog posts to make them accessible beyond the USAID Development Experience Clearinghouse, where the annual reports are posted once approved. Social media grew to include LinkedIn with 580 followers; on Facebook with more than 1,200 followers and X (formerly Twitter) with more than 1,700 followers. Two issues of the Lively newsletter were sent out in FY 2023; they are archived on the news section of website. Many new webpages were created, and these include LSIL Academy, ongoing and completed projects.

II. Target Country Key Accomplishments

After each key accomplishment, we indicate the Development Objective of the relevant Country Development Cooperation Strategy to which the achievement contributes.

Burkina Faso
In FY 2023:
- Thanks to strong stakeholder support, the baseline survey (350 households/23 villages) was conducted despite a challenging and further deteriorating security situation in the Centre-Nord Region.
- The survey results showed that ASF is consumed occasionally and influenced by socio-cultural constructs, negatively affecting young children and pregnant women. Traditional production systems pose potential risks to the health and nutrition of producers, especially women and children who are more frequently interacting with poultry.

Ethiopia
In FY 2023:
- Formative research in Sidama region showed that many dairy-producing households dilute their milk with water to "stretch it out" for all household members. In addition to the nutritional implications, this practice could potentially impact milk safety and will influence the project sampling process. (Contributing to Ethiopia's Country Development Cooperation Strategy – Development Objective 4: Sustained Improvement in Essential Service Delivery Outcomes Focused on Women and Girls)

Nepal
None – as in-country activities didn't start until Q4.

Niger
In FY 2023:
- The baseline survey (220 households/10 communities) showed only 25.23% of respondents were aware of existing feed technologies. The awareness and use of feed technologies varied significantly ($P < 0.05$) according to their regional background, membership in farmers' organizations, and education level of heads of households. The most common feed technologies used were dual-purpose cultivars for fodder production, chopping, feed ration packaging and urea treatment. (Contributing to Niger's Country Development Cooperation Strategy – Development Objective 2: Inclusive Economic Opportunities Improved)

Rwanda
In FY 2023:
- In Nyamagabe and Gakenke districts, research showed that health constraints (viral and bacterial as well as parasitic diseases), high cost of inputs, feed scarcity in the dry season and farmer knowledge gaps in pig rearing are important constraints to pig production. Also, women are more constrained than men in transporting the pigs to the markets, often settling to sell at the farm gate which results in lower prices. (Contributing to Rwanda's Country Development Cooperation Strategy – Development Objective 3: PROSPER – Increased Inclusive and Sustainable Private Sector-driven Growth)
- In Nyagatare district, preliminary results from the formative research indicate that although women in the communities, including Community Health Workers, are aware of the nutritional benefits of eggs, consumption is currently very low as is the consumption of Sosoma. (Contributing to Rwanda's Country Development Cooperation Strategy – Development Objective 1: THRIVE – Improved Health Outcomes)

III. Research Program Overview and Structure

a) Overview

The vision of the Livestock Systems Innovation Lab (LSIL) is to sustainably intensify smallholder livestock systems to improve the nutrition, health, livelihoods, and incomes of vulnerable people. This vision is achieved through research, technology application, local capacity building, and knowledge generation. The objectives of LSIL are to:

- sustainably improve livestock productivity and marketing and animal-source food (ASF) consumption using appropriate improved technologies, capacity development, and policy advocacy,
- increase the resilience of vulnerable populations,
- reduce the environmental impact of livestock systems, and
- advance the understanding of evolving livestock systems and their roles in food security, nutrition, and health.

The Lab's efforts encompass three Areas of Inquiry (AOI) and four Cross-Cutting Themes (CCT). Each of these is led by one or two UF faculty members. The Lab's AOIs are: 1) Livestock Production & Disease Management, 2) Human Health, Food Safety, Diets & Nutrition, and 3) Markets & Innovation Translation. The CCTs are: 1) Local Capacity Development (LCD, 2) Gender and Youth, 3) Enabling Environment, and 4) Future Livestock Systems and Resilience. See section IV for more details.

As of September 30, 2023, the LSIL research portfolio is comprised of five long term (Reach) projects, four short term (Focus) projects, and one Challenge Project. Seven LCD projects and four remaining Focus projects are expected to start in Q1 FY 2024. In Q2 and Q3 we plan to issue the scaling projects. As a reminder, we explain the nature of the projects below:

- **Reach projects:** These are longer term, large grants issued as subawards to the lead organization for projects lasting up to three years with budgets of up to $750,000. Reach projects commonly involve multiple partners and employ an integrated, interdisciplinary approach involving both research and capacity development components; however, the primary focus is research.
- **Focus projects:** These are shorter term, smaller grants issued as subawards to the lead organization for projects lasting up to a year and a half with budgets of up to $125,000. Focus projects address a proof of concept or conduct research for development bridging studies that yield near-term beneficial impacts.
- **LCD projects:** These are projects for up to 2 years designed to encourage systems thinking and complement the LCD activities of Phase II Reach and Focus projects. Only target country institutions involved in past and present LSIL projects could apply. Applicants could submit proposals for three types of projects: 1) individual projects: up to $30,000, addressing one LCD priority area and demonstrating an organizational impact; 2) consortium projects: up to $70,000, addressing at least two LCD priority areas and initiating system-wide change; and 3) consortium+ projects: up to $100,000, addressing LCD efforts of all Reach and Focus Projects of Phase II, at least two LCD priority areas, and initiating system-wide change.
- **Challenge:** This $2 million project is designed to test the effects of maternal egg consumption during pregnancy on birth length and how this effect is different from a popular nutrient dense plant-based food in Rwanda, when compared to typical diet. A restricted request for applications (RFA) was issued in FY23 to identify the implementing partner. More on this project and its research progress, later in this report.
- **Scaling:** Through an innovative RFA process, we envision awarding funds ($300,000) for one or more scaling projects for in-country private sector actors to examine the best scaling pathways for select livestock-related innovations.

b) Structure

In Phase II, LSIL works in Burkina Faso, Ethiopia, Nepal, Niger, and Rwanda (for details see Appendix A with the list of subawards). The USAID/Haiti-funded Système d'Innovation en Production Animale (SIPA) Associate Award project in Haiti (May 2023- May 2028). The Bill & Melinda Gates Foundation-funded EQUIP project was extended until December 2023 and works in Ethiopia and Burkina Faso. Other projects funded by the Bill & Melinda Gates Foundation include Market Analysis for Pastoralists (MAP) (Sept 2020 – February 2023) and the Precision Livestock Farming Technologies Evaluation in Africa (August 2023 – August 2025) Table 6 shows the USAID-funded projects that were selected for funding. Some of them are not yet active due to contractual arrangements (See also XIII-Issues). The projects are organized by country, project type, AOI and CCT. The LSIL encourages (in the case of Focus projects) and requires (Reach projects) that projects address more than one AOI, facilitating cross-project linkages across the project countries.

Table 6. Distribution of USAID Funded Projects active in FY 2023 (under the Prime Award by Target Country, Area of Inquiry and Cross-Cutting Theme)

Type	Country	Project Title	Area of Inquiry				Cross-Cutting Theme			
			AOI 1		AOI 2	AOI 3	LCD	G & Y	FLSR	EE
			Livestock Production	Disease Management	Human Health, Food Safety & Diets, and Nutrition	Markets and Innovation Translation	Local Capacity Development	Gender and Youth	Future Livestock Systems and Resilience	Enabling Environment
Reach	Burkina Faso	Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach		•	•	•	•	•	•	•
Reach	Ethiopia	Aflatoxin M1 Health Risks vs. Benefits of Dairy Consumption in Ethiopian Children: An Epidemiological Trial and Risk-Benefit Analysis	•		•		•	•	•	•
Focus	Ethiopia	Improving Smallholder Poultry Production and Egg Consumption in Children Under Two in Ethiopia		•	•		•	•		
Reach	Niger	Enhancing the Productivity and Resilience of Agro-Pastoral Systems, and Income, Food and Nutrition Security Through Market-Oriented Innovations in Niger	•		•	•	•	•	•	•
Reach	Rwanda	Profiting From Pigs in Rwanda: Improving People's Lives and Livelihoods Through More Productive Pig Farming	•			•	•	•	•	•
Focus	Rwanda	Developing Climate-Smart Management Strategies to Improve Sustainability of Smallholder Dairy Cattle Production Systems in Rwanda.	•				•	•		
Focus	Rwanda	Application of the Integrated Decision Support Systems to Improve Livestock Systems and Household Nutrition in Rwanda: Research and Capacity Development	•				•			
Challenge	Rwanda	Deux Oeufs: Cracking the Potential of Eggs to Improve Child Growth and Development			•		•	•		•

IV. Theory of Change and Impact Pathway

The goal of the Feed the Future initiative is to reduce global poverty and hunger through fostering growth in the agricultural sector and improving the nutritional status of vulnerable people around the world. The LSIL supports this mission by increasing knowledge on how the evolving livestock system is interlinked with human health and nutrition. This is accomplished through developing technologies, improving livestock-related practices, and facilitating stakeholder environments to support the research-to-practice pipeline. Through a multi-pronged approach, LSIL engages in four major activities across local, national, and regional levels of the livestock-value chain: 1) supports and conducts research; 2) acquires, integrates and shares knowledge; 3) develops human and institutional capacity across different levels of the livestock-value chain; and 4) develops and engages in strategic partnerships, networks, and communications with stakeholders.

Through these four activities, LSIL creates the conditions for four types of change/outcomes:
- **Improved behaviors and practices** of individuals, organizations, and institutions, which contribute to healthy and productive livestock, healthy and empowered people, and healthy and safe environments where ASF is produced and consumed. This is accomplished through developing innovations and training livestock sector actors on improved practices.
- **Improved dietary outcomes** by providing knowledge and resources for more balanced diets of target populations, especially for young children and pregnant and lactating women. This is accomplished through designing research activities aimed at increasing the consumption, availability, accessibility, affordability, and safety of ASF while also considering the safety and health of the surrounding environment where ASF is produced and consumed. Where relevant, these changes are meant to also lead to increased household incomes and women's empowerment.
- **Stronger researchers and research systems** through strengthening the next generation of scientists, collaboratively producing scientific knowledge, partnering with research institutions, and building institutional capacity. This is accomplished through university student and researcher training, funding a diverse research portfolio, and providing targeted support for research institutions to improve their research support capacity and advocate for evidence-based policy change.
- **Enhanced research to practice pipeline** through strengthening and empowering stakeholder networks and increasing the knowledge needed to make science-informed policy decisions in the livestock sector. This is accomplished through continuous stakeholder engagement, participatory platforms for stakeholder communication, and knowledge sharing to support decision-making.

The research activities of the Lab are organized by three AOIs and four CCT, each one of which contributes to the planned changes listed above.

AOI 1. Livestock Production & Disease Management
Diseases reduce the performance and efficiency of livestock production and limited, or low-quality animal feed can negatively impact livestock health. As livestock numbers grow and infectious and zoonotic diseases spread among livestock and humans, this line of research grows ever more urgent. For improved livestock production, it is important to better understand and promote strategies to increase the resilience of the livestock system, how feed price and feed quality are related, how to advance feed preservation, and how to reduce production costs related to animal source food production. For improved disease management, it is important to better understand and promote strategies that improve disease management practices, combine epidemiology and economics for decision-making, and advance public-private partnerships.

AOI 2. Human Health, Food Safety, Diets & Nutrition
For healthy and sustainable human diets, food must be both safe and free of pathogens as well as nutritionally sound. To understand and promote improved practices related to food safety, improved knowledge and strategies are needed regarding human-livestock interactions, food safety risks, culturally appropriate food safety interventions, and risk assessments to support the development of safety standards. To understand and improve human diets, knowledge and strategies are needed to understand the ASF production impact on nutritional outcomes, the barriers to ASF consumption, and the behavioral changes needed for increased ASF consumption.

AOI 3. Markets & Innovation Translation
For livestock production to improve household, local, and national economies, livestock markets must have strong performance, and innovations to improve ASF value chains must be scaled. Research is needed, therefore, to better understand the relationships between ASF pricing with affordability, consumption, and household/community resilience. Knowledge is also needed on the resilience of livestock economic markets to different stressors and how the private sector can

be engaged to alleviate these stressors. Finally, strategies are needed to advance market-based solutions to improving the ASF value chain and promote the scaling of innovations.

CCT 1. Local Capacity Development

The aim of this CCT is to build the capacity of actors across the livestock system to engage with, carry out, and eventually lead improvements to the livestock system. This CCT uses a participatory process to determine local priorities and strategies to build this capacity. This participatory process includes consultative meetings and the co-design of pilot projects that address systematic livestock research issues. Methods of engagement with local actors include mapping the actors within the sector, refinement and clarification of systemic problems, the design of efforts to overcome these issues, and the monitoring of these efforts.

CCT 2. Gender and Youth

Access and control over productive resources as well as the benefits from livestock production, processing, and marketing are not equitable. This CCT uses an intersectional approach that considers gender and age as well as other factors that limit opportunities for individuals in the livestock sector, such as caste, race, religion, education, employment, and socio-economic status. Research and approaches examine women and youth engagement, women and youth empowerment, entrepreneurship and private sector engagement, and the relationship between gender and nutrition.

CCT 3. Enabling Environment

The aim of this CCT is to assess and enhance the national context for supporting livestock policies and institutions. This is achieved through engaging with diverse stakeholders in all five target countries to identify and address knowledge gaps, promote effective mechanisms for dialogue and consultation, and convene engaging platforms for information and knowledge sharing to support the formulation or implementation of policies that improve the performance and sustainability of livestock systems. Specifically, this CCT strengthens the capacity of local actors to understand key research findings, strengthens stakeholder networks, and advances understanding of each country's political economy and the relationship between research and policy.

CCT 4. Future Livestock Systems and Resilience

Future Livestock Systems research explores the transition from more vulnerable livestock systems, which struggle to address increased demands for food, to systems that foster equitable wealth, food security, resilience and nutrition. Its modeling and analytical tools are useful to evaluate technologies and inform management and policy scenarios into the future. This CCT will advance knowledge and understanding of the relationships between resilience with pastoralism, forage systems, and value chain networks. With information based on analysis of complex local to regional choices, policymakers and other stakeholders can seek solutions to meet the needs of dynamic populations and environmental conditions.

V.   Research Project Reports

Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach	
	Reach project, April 1, 2022 – March 31, 2025
PI Name & Organization: Michel Dione, International Livestock Research Institute (ILRI)	**Collaborators**: University Joseph Ki-Zerbo Ouagadougou, Institute of Environmental and Agricultural Research; Ministry of Agriculture, Animal Resources and Fisheries. Internationally: University of Florida (UF); Kyeema Foundation
Description: Poultry keeping among rural households in Burkina Faso represents an important component of livelihoods. This project aims to enhance household food security and safety and improve the livelihoods of poultry smallholder producers by reducing economic losses and zoonotic risks along the value chain, and by developing culturally and economically appropriate, gender-sensitive One-Health (OH) interventions at the producer level, resulting in reduced flock mortality, pathogen occurrence, and human health risks.	
Location: Centre-Nord	

Theory of Change and Impact Pathway

Poultry disease in Burkina Faso can negatively affect human health and constrains the productivity of the poultry market. By developing interventions that improve farm and market practices, provide education and training, and test business models that can enhance value chain linkages, the poultry sector can become safer and more productive.

Activities and Achievements

Assess the knowledge, attitudes, and practices of smallholder poultry producers and other connected value chain actors. The baseline survey (350 households/23 villages) showed that ASF is consumed occasionally and influenced by socio-cultural constructs, negatively affecting young children and pregnant women. Findings also show that traditional production systems pose potential risks to the health and nutrition of producers, especially women and children who are more frequently interacting with poultry. Local husbandry practices expose communities to pathogens through free-range practices, poor feeding infrastructure, absence of hygiene and poor monitoring of animal health. Children are frequently exposed to enteric pathogens through accidental ingestion in the home environment. Difficulties in accessing reputable veterinary services lead farmers to resort to non-conventional medicines, hence delaying adequate treatment of sick and possibly infectious poultry.

Develop and test appropriate Integrated Educational and Training packages using a holistic approach. Ten One Health Poultry Champions (OHPCs, 6 male, 4 female) selected from various institutions have received high-level training in the OH approach and how to use it to respond to the gaps in biosecurity on poultry farms. They are also involved in the development of the Integrated Educational and Training (IET) packages using a holistic approach that promotes hygiene practices, biosecurity, improved management, poultry health and welfare, and production of high-quality poultry products. The IET complements existing training manuals from the National Poultry Promotion Center (CPAVI).

Build the capacity of the next-generation of researchers on poultry health and food safety research using a One-Health approach and improve networking and collaboration among value chain stakeholders. Two hundred and eleven stakeholders (including 64 female) were engaged through project workshop launches at central and local levels, site scoping, intervention design, data collection and intervention validation workshops. There is strong buy-in from community representatives such as local leaders and Voluntary Village Extensionists and technical partners such the Animal Resources and Fisheries of the North Central and the Livestock Technical Support Zones (at the communal level).

Local Capacity Development

Three MS students (2 male, 1 female) from UJKO and one PhD student from the School of Veterinary Sciences and Medicine of Dakar Universities (EISMV) are already involved in the development of research protocols and field tests. The PhD student attended a training workshop on bioinformatics at the Medical Research Council (MRC) Unit the Gambia. The project collaborated with CPAVI to train ten OHPCs so far. Ten enumerators benefited from training in epidemiology, participatory assessment of poultry health services, and gender-sensitive survey methods. A livestock gender scientist at INERA is working with ILRI gender scientists to improve gender integration in the project's research activities.

Lessons Learned

- Engaging stakeholders from the start and making sure there is a common interest has enabled the team to carry out fieldwork effectively with community buy-in and participation even in an insecure area such as the Centre-Nord region. While the curfew has restricted the team's movements in the area, impact has been limited thanks to the strong local support including a veterinary officer as the project focal point, appointed by the regional director of agriculture and livestock.

- Completing the agreement with UJKO has been challenging because of lack of documentation to respond to the due diligence process carried out by ILRI. This has delayed activities under Objective 2. Further challenges are due to the lengthy procurement process for laboratory consumables. To avoid further delays, other activities were prioritized.

b) Ethiopia – Reach and Focus Project Reports

Aflatoxin M1 health risks vs. benefits of dairy consumption in Ethiopian children: An epidemiological trial and risk-benefit analysis _ _ _ _ Reach project, June 6, 2022 – June 5, 2025	
PI Name & Organization: Felicia Wu, Michigan State University (MSU)	**Collaborators**: Ethiopian Public Health Institute (EPHI). Internationally: International Food Policy Research Institute (IFPRI)
Description: Aflatoxin M1 (AFM1), found in dairy foods, is a metabolite of aflatoxin B1 (AFB1): a toxic and carcinogenic mycotoxin produced by the fungi *Aspergillus flavus* and *A. parasiticus* in food and feed crops such as maize, groundnuts, tree nuts, and seeds. This project aims to determine whether AFM1 exposure in milk is associated with child growth impairment and to compare any risks with nutritional benefits of milk consumption in children through a longitudinal cohort study in Ethiopia. Based on our results, we will design policy recommendations and education-outreach workshops and briefs to enable sensible policy on AFM1 regulation and dairy nutrition.	
Location: Sidama Regional State (Aletachuko and Wendo Genet woredas)	

Theory of Change and Impact Pathway
Knowledge is currently lacking on the tradeoffs for children between aflatoxin M1 exposure in milk and nutritional outcomes. A longitudinal cohort study of children in Ethiopia can help clarify this connection and lead to policy recommendations on AFM1 regulation and dairy nutrition.

Activities and Achievements
Determine the association between milk consumption and growth outcomes in children 6-36 months of age.
Through the collaboration with IFPRI, non-LSIL funds were used to conduct formative research among dairy-producing households with children 6-18 months of age. Information was gathered about feedstocks used for their dairy cows, size of their herds, knowledge about feed contamination with aflatoxin and methods to reduce mold and aflatoxin contamination of feed, where they source the milk to feed their children, and whether there are seasonal differences in the above variables. The findings are used to inform selection of households for the intervention. Subsequently, one-on-one and focus group discussions were conducted to understand more about the size of dairy cattle operations in households in Sidama, dairy farmer practices regarding feed, feed processors' knowledge and practices regarding aflatoxin and feed quality generally, and caregiver feeding practices and milk purchasing incentives. These findings will inform further field research.
An unexpected finding was to learn that many dairy-producing households in Sidama dilute their milk with water to "stretch it out" for all household members. With the help of nutrition expert Dr. Barbara Stoecker at Oklahoma State University (a collaborator of Ethiopian Public Health Institute, [EPHI] partner Dr. Masresha Tessema for several years), we determined that it was best to test nitrogen content and to collect the milk that is going to be fed to the child whose anthropometrics will be taken (may or may not be diluted), rather than milk directly taken from the cows because the milk given to the child is representative of his/her AFM1 exposure as well as intake of milk borne nutrients and other contaminants. Other statistical issues regarding sampling of households by herd size, location, and seasonality-related issues have been resolved. The difficulties in procuring supplies and equipment for the field work have been resolved.
Work on the other two objectives (Determine the association between AFM1 exposure and growth outcomes in children 6-36 months of age who consume milk; Compare health benefits vs. risks of dairy consumption in child growth outcomes and derive policy recommendations for regulation of AFM1 and communications about dairy consumption and risk-benefit tradeoffs) will be initiated next year.

Local Capacity Development
Dr. Masresha Tessema at EPHI and Dr. Kalle Hirvonen at IFPRI are training enumerators and staff to conduct the household surveys in Q1 FY 2024. The PI took advantage of being in country for the project and Innovation Platform meetings to inform various stakeholders about the risks of aflatoxin B1 (AFB1) and aflatoxin M1 (AFM1) in their foodstuffs, and how to best reduce the presence of these aflatoxins in foods and dairy. The same presentation was also given at the EPHI in collaboration with Dr. Amare Ayalew and Mr. Wosenyeleh Ambaw. Since then, we have also built bridges with Addis Ababa University, Hawassa University, and Oklahoma State University to collaborate in this work.

Lessons Learned
- Obtaining Institutional Review Board (IRB) approvals from MSU and in Ethiopia was only completed in March 2023 which severely delayed the project as MSU doesn't allow spending any funds before approval. This should have been considered in the project planning.
- Purchase of laboratory supplies in Ethiopia through EPHI is time consuming and more costly than anticipated. It was decided that MSU will purchase them in the USA and ship them to Ethiopia.

Improving Smallholder Poultry Production and Egg Consumption in Children Under Two in Ethiopia	
Focus project, February 1, 2023 – July 31, 2024	
PI Name & Organization: Andrew Stringer, University of Liverpool	**Collaborators**: Addis Ababa University (AAU), Ethiopian Institute of Agricultural Research (EIAR). Internationally: University of North Carolina - Chapel Hill (UNC), North Carolina State University (NC State)
Description: Stunting and malnutrition continue to be prevalent in children under 5 years old in Ethiopia. Animal-source foods are the most impactful, high-quality nutrient-dense foods for children 6–23 months of age. Eggs provide critical nutrients similar to or exceeding other ASF, and in specific contexts, egg consumption has been demonstrated to lead to improved nutritional outcomes. Poultry in Ethiopia is increasingly identified as a priority species. However, significant production constraints have been identified by Ethiopian poultry producers along the value chain, including infectious diseases such as Newcastle Disease Virus. The project has two overarching goals: 1) to improve smallholder poultry production through reducing poultry mortality, and 2) increase egg consumption in children under two in poultry owning households in Ethiopia.	
Location: Central Ethiopia Regional State (Gurage and Hadiya zones), Oromia region	

Theory of Change and Impact Pathway

Increased consumption of eggs could reduce stunting and benefit health, cognition, and growth of children in Ethiopia. However, production challenges, including infectious diseases, currently constrain the growth of the poultry sector. Integrating a poultry health intervention program with a human nutrition intervention package can capitalize on these two issues and provide benefits to both poultry and human health.

The focus of the project activities to date have been on operationalizing Objectives 1 and 2. Subaward contracts to the University of Liverpool and collaborating partner institutions in Ethiopia and the US are nearly completed.

Assess the acceptability and feasibility of feeding eggs to children 6–23 months of age. The topic guide for focus group discussions is in the final stage of development, and study locations have been agreed upon. An application for ethical approval under the College of Health Sciences, Addis Ababa University (AAU) will be submitted in early November. Data collection is planned for December 2023 – January 2024.

Determine the demand and preferences of poultry owners to improve poultry health and production. Pilot work on the Willingness to Pay (WTP) scenarios and development of the sampling framework for the household selection is underway. An application for ethical approval under the College of Veterinary Medicine and Agriculture (CVMA), Addis Ababa University will be submitted in early November. An MS student (female) from the CVMA, AAU has been recruited to work with the project on this objective. In addition, a gender study is being developed for possible inclusion in this objective.

Local Capacity Development

A two-day workshop on: *Integrating Gender into the Poultry Value Chain in Ethiopia* was delivered by Dr. Colverson (UF). The workshop was designed to train the project team on various gender-related aspects. The workshop objectives were to:

1. understand the importance of gender roles and norms in the poultry value chain,
2. explore strategies and approaches to addressing gender constraints in the poultry value chain,
3. learn techniques for how to integrate women more actively in training workshops,
4. practice developing a project by integrating gender and youth.

An MS student (female) from the CVMA, AAU has been recruited to work with the project on Objective 2 (Determine the demand and preferences of poultry owners to improve poultry health and production). A Personal Development Plan (PDP) has been established for Co-PI Dr. Jirata Shiferaw.

Lessons Learned

- A key lesson learned to date has been the extended time needed to set up the subaward contracts with collaborating institutions. This will require the project timeline to be revised.

Integrated Approach to Enhance Milk Quality, Dairy Animal Productivity and Milk Consumption by Vulnerable Household Members in Rural Nepal	**Reach project, September 1, 2023 – September 30, 2025**
PI Name & Organization: Bhola Shrestha, Heifer Project International (HPI)	**Collaborators**: Nepal Agricultural Research Council (NARC). Internationally: University of Florida (UF), Tufts University
Description: Improvements in dairy value-chains do not always correspond with improvements in human nutrition. A multi-dimensional intervention that provides mobile phone-based decision tools for farmers, improved forage varieties for livestock, price bonuses at milk collection centers for quality milk, and dairy consumption behavior change supports for households will improve dairy production, quality, prices, and household consumption.	
Location: Lumbini, Gandaki and Bagmati Provinces	

Theory of Change and Impact Pathway

If access to technologies increases and availability of quality inputs ensured, it will lead to increases in production and productivity reducing per unit production cost. If producers are trained and motivated through price incentives, the quality of product will improve. If consumers are made aware of the nutritional value of quality milk, the demand for milk will increase and thus help in the overall flourishing of the dairy sector of the country.

Background

The Government of Nepal, as documented in the Agriculture Development Strategy from 2014, is prioritizing dairy as the second most important agricultural value chain after rice that has potential for economic contributions. The productivity of dairy animals is generally poor and due to lack of poor access to innovations, inputs and services. The quality of dairy based products is substandard due to lack of knowledge or negligence by producers and milk handlers as well as absence of incentives for producing hygienic, high-quality milk. Inadequate knowledge about the value of animal-source food (ASF) consumption, and various barriers on consumption of milk and milk products, are some of the factors keeping Nepal's dairy sector from flourishing as it could.

Objectives

The overarching goals are to strengthen the dairy sector in Nepal through productivity and quality improvements, to promote farmer economic development, and to increase milk consumption by vulnerable household members. Specific objectives include:

1. Improve the productivity of dairy animals through enhanced access to technologies, farm management tools and increased feed and fodder supply.
2. Improve milk quality via adoption of Good Hygiene Practices through price incentives for farmers that stimulate delivery of quality milk to milk collection centers.
3. Identify and overcome barriers to milk consumption for vulnerable household members.

Approach/Methodology

An interactive information and communication platform will be developed to improve dairy farmers' access to innovation and technologies. Digital information about basic animal husbandry practices and an interactive platform to facilitate linkage with experts on specific technologies will be provided to the 50+ dairy farmers in the treatment group. An equal number of dairy farmers will constitute the control group. Animal performance as well as economic outcomes for both groups will be compared. Access to quality feed is to be improved and forage based dairy production will be promoted to reduce costs of production. Different summer, winter, and perennial forage crop varieties (leguminous and non-leguminous) that are in Nepal Agricultural Research Council's (NARC) development pipeline will be screened at project sites. Varieties high in nutritional quality as well as green biomass yield will be promoted for adoption. Both farmers and milk handlers will be trained in Good Husbandry Practices and Good Manufacturing Practices to promote clean and hygienic milk production. Premium prices for quality milk producers (low conductivity/low somatic cell count) will be piloted and its sustainability will be searched in collaboration with milk processors. The National Dairy Development Board (NDDB) will help in policy formulation and advocacy on a quality-based milk pricing system. Consumption of milk and other ASF by vulnerable household members is limited by multiple cultural, structural, and economic barriers, even in dairy-producing households. The research team will characterize these barriers in detail and conduct a randomized controlled trial to test a multi-faceted behavior change intervention designed to increase ASF/milk consumption by young children, adolescent girls, and women of child-bearing age. Mothers, fathers, and adolescent girls will participate in intervention activities; novel outcome metrics will broaden our understanding of impacts.

Activities and Achievements

The subaward for this project was only fully executed in Q4 FY2023; hence, there is nothing to report yet.

Local Capacity Development

None so far.

Lessons Learned

None so far.

Socioeconomic Impact of the COVID-19 Pandemic on the Dairy Value Chain in Western Nepal		
Focus project, December 1, 2022 – April 30, 2024		
PI Name & Organization: Gerrit Hoogenboom, University of Florida (UF)		**Collaborators**: Agriculture and Forestry University (AFU), Forum for Rural Welfare and Agricultural Reform for Development (FORWARD), Nepal
Description: It is unknown how the COVID-19 pandemic has affected different actors across the dairy value chain in Nepal, including the socioeconomic effects on vulnerable groups. By understanding how this sector adapted or failed to adapt during COVID-19, improved intervention strategies can be designed to help this sector recover from the COVID-19 pandemic and prepare for similar future challenges.		
Location: Doti and Kailali (Far-western region); Dailekh, Surkhet and Banke (Mid-western region); Palpa and Kapilvastu (Western region)		

Theory of Change and Impact Pathway

It is unknown how the COVID-19 pandemic has affected different actors across the dairy value chain in Nepal, including the socioeconomic effects on vulnerable groups. By understanding how this sector adapted or failed to adapt during COVID-19, improved intervention strategies can be designed to help this sector recover from the COVID-19 pandemic and prepare for similar future challenges.

Background

Dairy livestock is an essential component of the integrated crop-livestock farming system in Nepal and has played a crucial role in retaining a circular bioeconomy within small-holder farming communities. It provides a significant contribution to household nutrition and also plays a crucial role in Nepal's predominantly agriculture-based livelihood. However, the COVID-19 pandemic has adversely affected the dairy sector in Nepal. Information on the effects of a pandemic, such as COVID-19, on the dairy value chain in Nepal is rare because it is a completely new circumstance. The nature and extent of the impacts of the COVID-19 on the dairy value chain actors, the demands and needs of various stakeholders, and adaptation strategies are largely unknown. There is no documentation on the effects of the pandemic on access to inputs such as feed, fodder, veterinary services, and market information. Similarly, little is known on how the individual farmers, dairy co-operatives, regional milk-collectors and chilling centers, large dairy entrepreneurs, dairy input suppliers, and end consumers are adapting to these current highly volatile conditions. There is also little information on how these changes in the dairy sector have impacted the health and socioeconomic condition of children, local youth, women, and marginalized groups. Also, information on differential effects of the pandemic on the dairy farmers in the mid-hills and terai and on locally based small-holder dairy farmers (shorter value chain) and larger-scale commercial dairy farmers (longer value chain) are lacking.

Objectives

The overarching goal of this project is to assess the socioeconomic impact of COVID-19 pandemic on the dairy value chain in Nepal. Specific objectives include:

1. Understand the differential impacts of the pandemic on each node of the dairy value chain in different districts and farm categories, such as smallholder vs commercial farmers, and short vs long value chains.
2. Determine the appropriate intervention strategies to cope with the adverse impacts of COVID-19 pandemic on dairy value chain.
3. Capacitate the main actors of the dairy value chain, including youths and women.

Approach/Methodology

A detailed value chain analysis of the dairy sector will be conducted. The impacts of COVID-19 on each node of the value chain will be assessed. Both qualitative and quantitative data will be collected for the study. The study will mainly be based on primary data collected from the study sites through surveys. A mix of different tools will be used to collect the primary information including a household survey, consumer survey, focus group discussions, key informant interviews, virtual meetings, and participatory field observations in selected districts.

Activities and Achievements

The activities have been on hold since the two Nepali subaward organizations were not able to meet the requirements of a cost reimbursable agreement they had agreed on. This meant that their agreements had to be converted into fixed amount agreements which took time (see Section for more details on this topic).

Local Capacity Development

None so far.

Lessons Learned

The delay in the start of activities will require the project timeline to be revised.

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The Focus project "Modeling Community-Led Goat Genetic Improvement Program into Sustainable and Profitable Business" by Heifer Project International will start in Q1 FY 2024.

The activities of Heifer Project Nepal on "Digital Mentoring and Continuing Education for Improved Service and Market Linkages among Community Animal Health Workers in Nepal" are reported under AOI3 and not as a separate project.

d) Niger – Reach Project Report

Enhancing the productivity and resilience of agro-pastoral systems, and income, food and nutrition security through market-oriented innovations in Niger	Reach project, September 29, 2022 – September 28, 2025
PI Name & Organization: Clarisse Umutoni, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	**Collaborators**: Dan Dicko Dankouloudo University of Maradi, Abdou Moumouni University, Amate Seed Farm, Ainoma Seed Farm, Association for the Promotion of Livestock Production in the Sahel and Savannah. Internationally: Arizona State University (ASU), Cultivating New Frontiers in Agriculture (CNFA)
Description: Despite the important role of livestock in the farming and livelihood systems and the national economy, livestock has failed to reach its full potential in Niger. Limited work has been done on integrated climate-smart technologies and approaches to improve inclusive crop-livestock systems and value chains, increase incomes, reduce multidimensional poverty, and improve nutrition and health. This project aims to reduce multidimensional poverty through market-oriented crop-livestock integration, and specifically improve nutrition through on-farm diversification and by enhancing income and livelihood resilience of agro-pastoralists in Niger.	
Location: Maradi and Tillabéri Regions	

Theory of Change and Impact Pathway

Agropastoral systems in Niger have limited productivity due to low market performance and the inability of markets to meet seasonal demands. By providing on-farm diversification and creating business opportunities around crop-livestock value chains, agropastoral systems and livelihoods can become more resilient.

Activities and Achievements

Identify entry points for promoting/enabling productive, resilient, climate smart and sustainable agro-pastoralist systems. In Q1, a comprehensive literature review on agro-pastoral systems identified what additional information is needed to characterize current (baseline) agro-pastoral systems in Niger and to input in the Crop Livestock Enterprise Model (CLEM). Based on this review, the project team designed and conducted a baseline study in Q2 (220 households in 10 communities; complemented with focus group discussions). Only 25.23% of farmers were aware of existing feed technologies. The awareness and use of feed technologies among agro-pastoral households varied significantly ($P < 0.05$) according to their regional background, membership in farmers' organizations, and education level of heads of households. The most common feed technologies used were dual-purpose cultivars for fodder production, chopping, feed ration packaging and urea treatment.

Increase small ruminant productivity through the development of climate smart feed systems. The team engaged with 360 producers (231 male and 129 female) to promote integrated systems of legumes and cereals to improve fodder production, sustainability and resilience of production systems on about 150 ha. It also introduced forage varieties to improve the production of quality fodder. Training on tropical forage production was provided to 157 farmers (14 male, 143 female). Nine women's associations (137 female supported by 2 male) and eighteen individual farmers (12 male, 6 female) were engaged in on-farm tests of fodder crops (improved pigeon pea (*Cajanus cajan*), lablab (*Dolichos lablab*), *Mucuna pruriens*, cowpeas (*Vigna unguiculata*) and Maralfalfa grass (*Pennisetum purpureum*) covering ~10 ha. Four agro-pastoralist field schools (APFS) involving 45 male and 59 female, have been established to facilitate innovation transfer. A customized curriculum was developed for each APFS. The APFS participants developed an action plan and decided what activities needed to be undertaken to address their problems and identify what kind of support they would need from the project team. Through APFS, farmers become "farmer-researchers" which motivates them extremely well.

Identify and promote evidence-based strategies for the development of markets and inclusive value chains of small livestock and goat milk for improving household income and nutrition. The innovation platform meeting in Maradi, with 30 participants (23 male and 7 female) led to meaningful insights on (a) the functioning of fodder markets and the role of the various actors along the value chain; (b) the challenges and existing opportunities at all stages of the small ruminant value chain; and (c) the utility and limitations of farm level gross margin analyses.

Improve household nutrition through improved consumption of Animal Source Food and diverse diet. In Q4, a survey (220 households) assessed ASF consumption patterns, household factors impacting the selection and consumption of ASF, frequency in consumption of ASF, among others. Results will inform a large ASF public awareness campaign.

Engagement with other initiatives. The project team partnered with the USAID Yalwa Activity, FAO-Niger and the Regional Center of Excellence on Productions Pastorals: Milk, Meat, Leather and Skins (CERPP) on various topics. ICRISAT also participated in the Agricultural Technologies & Innovation Fair organized by the Yalwa activity in Maradi in June 2023.

Local Capacity Development

The project has engaged four students (1 PhD, 2 MS, 1 BS; all male) and four interns (3 male, 1 female). As a result of their involvement in the project, students and interns have improved their skills in survey design and/or data collection.

Lessons Learned

The growing insecurity in the Tillabéri region and the coup d'état in Q4 restricted project team movements. To address this challenge, APFSs facilitators were equipped with smartphones and created a WhatsApp group to support their activities remotely. This mechanism allows for the smooth implementation of the project activities despite movement challenges.

e) Rwanda – Reach, Focus, and Challenge Project Reports

Profiting from Pigs in Rwanda: Improving People's Lives and Livelihoods Through More Productive Pig Farming Reach project, April 15, 2022 – April 14, 2025	
PI Name & Organization: Emily Ouma, International Livestock Research Institute (ILRI)	**Collaborators**: University of Rwanda (UR), Rwanda Agriculture and Animal Resources Development Board (RAB), Land O'Lakes Venture37/Orora Wihaze Activity, Rwanda Pig Farmers Association (RPFA)
Description: Despite its potential, particularly for smallholders, the pig value chain faces critical production and market-related constraints in Rwanda. This project aims to improve the livelihoods of smallholder men and women pig producers, in a sustainable manner, through increased productivity and incomes and strengthened market linkages in pig value chains, and to strengthen the capacities of Rwanda's National Agricultural Research and Education Systems in pig husbandry, including the production and delivery of quality pig genetics.	
Location: Gakenke and Nyamagabe districts	

Theory of Change and Impact Pathway

The pig value chain in Rwanda has high potential but faces production and market related constraints related to reproduction, nutrition, husbandry practices, marketing, and processing. Integrating interventions that improve herd health, feeding, genetics, and market linkages can overcome these constraints and lead to a more productive pig sector.

Activities and Achievements

Develop, pilot, and evaluate an integrated pig husbandry package. Targeting Nyamagabe and Gakenke districts, the team conducted 1) a baseline survey (900 farmers from Nyamagabe and Gakenke districts) to inform and finetune the production enhancing interventions; 2) a participatory epidemiology study to identify pig health challenges. Results show that African Swine Fever, swine erysipelas (*Erysipelothrix rhusiopathiae*), worms, piglet diarrhea are endemic diseases with important economic impact. Apart from health constraints, high cost of inputs and farmer knowledge gaps in pig rearing are important constraints in pig production; 3) thus a feed assessment using Gendered feed assessment tool (G-FEAST) to identify available local feed resources was completed. Results show strong seasonal variability affecting feed availability. There is severe feed scarcity in June-August, corresponding to the long dry season. All these results will inform interventions that will be implemented in FY2024 and beyond.

Develop, pilot, and evaluate collective action business models. A gender assessment study was implemented to identify gendered constraints in pig production and marketing. Results show that women are more constrained than men in pig transportation and must rely on men for transportation of pigs to the market. They therefore often sell at the farm-gate, even though farm gate prices are lower. Production constraints affect men and women to varying degrees and require different strategies to address to avail opportunities to men and women (including youth). These results are being used to inform a gender sensitive collective action (through pig producer groups) business model for strengthening market linkages.

Support the national system and other stakeholders. Training materials on pig breeds and pig breeding developed for smallholder systems in Uganda and are being contextualized for Rwanda, including pig breed factsheets that will be used for training farmers and animal health workers. Discussions regarding an agreement with Pan Livestock Services to customize the InterHerd system to piggery for pig traceability and performance recording in breeding herds (i.e. herds receiving new genetics via imported pigs or semen) were advanced and activities will start in Q1 FY 2024.

Support the Centers of Excellence in development of an outreach program on pig keeping. Transcripts of PigSMART extension messaging developed in Uganda (as part of another ILRI project) are available in English. As the content would also be relevant to Rwanda, discussions are ongoing with potential partners to develop the audio skits in Kinyarwanda. The extension messaging offers piggery production advisory in an integrated manner covering feeds, breeding herd health, and heat stress and manure management.

Local Capacity Development

ILRI trained 13 staff (9 male, 4 female) from UR, RAB and government extension in G-FEAST tool to assess available feed resources and identify constraints and opportunities to inform feed interventions.

Lessons Learned

Some of the activities that were included in the project proposals such as the trainings of the artificial insemination (AI) technicians are already being implemented by the Belgian NGO, Vétérinaires Sans Frontières. We are in discussions to understand how we can add value to such trainings. Rather than focusing on the technical aspects of AI, we propose to develop training materials on aspects of breeds and breeding and the implications of upgrading the breeds.

Application of the Integrated Decision Support Systems to Improve Livestock Systems and Household Nutrition in Rwanda for Research and Capacity Development	**Focus project, April 10, 2022 – February 28, 2024**
PI Name & Organization: Raghavan Srinivasan, Texas A&M University System (TAMU)	**Collaborators**: University of Rwanda (UR), Rwanda Agriculture and Animal Resources Development Board (RAB). Internationally: North Carolina A&T State University (NCA&T)
Description: This project contributes to Rwanda's policy, programs, and capacity to address constraints related to livestock production and productivity to ensure access and consumption of animal-source foods for better nutrition and diversified diets within environmental boundaries. The project aims to contribute to the identification of the best combinations of feed production technologies within environmental boundaries and their potential impacts on livestock production and human nutrition in Rwanda, and to strengthen capacity for policy, programs, planning, and monitoring.	
Location: Western Province	

Theory of Change and Impact Pathway

To improve livestock fodder production in sustainable ways, an understanding of the integrated nature of humans, the environment, and livestock is needed. Using modeling systems to understand these dynamics will aid livestock farmers and decision-makers in targeting ways to sustainability intensify livestock fodder production in Rwanda.

Activities and Achievements

The project uses participatory and modeling approaches to understand and study the dynamics and ways to sustainably produce livestock fodder in Rwanda. The Integrated Decision Support System (IDSS) suite of models consists of biophysical and socio-economic simulation models that include the Soil and Water Assessment Tool, SWAT, Agriculture Policy Environment eXtender, APEX, and the farm income and nutrition simulator, FARMSIM.

During FY 2023, the preliminary socio-economic analysis as well as hydrological modeling has been conducted. After identifying major factors affecting land suitability for fodder production in Rwanda that include altitude, two rounds of stakeholder engagement, mainly from the Rwanda Agriculture and Animal Resources Development Board (RAB) and the University of Rwanda (UR), were held virtually to present the ranking and selection of forages suitable for 1) the Western province and 2) the entire country. The selection criteria and the ranking methods through a rapid assessment approach and assignment of weight for the different selected suitability factors were discussed at length among the participants. These six forages species were ultimately selected: Alfalfa *(Medicago sativa)*, Kikuyu grass *(Pennisetum clandestinum)*, Velvet bean *(Mucuna pruriens)*, Napier grass *(Pennisetum purpureum)*, Mulato *(Bracharia spp.)*, Greenleaf Desmodium *(Desmodium intortum).* The farm simulation is still being set up to capture and assess the impacts of using different fodder technologies and cow breeds on milk production and its subsequent impacts on human nutrition due to increase in milk production and consumption. Two national agriculture household surveys (AHS 2017 & 2020) were acquired from the National Institute of Statistics of Rwanda (NISR) to start gathering socio-economic data and information on agriculture and livestock production in Rwanda. However, the survey provides information on households at the district level and does not go into details and sample lower administrative levels such as the sector, cell and village. Fortunately, in Q3, the team was able to obtain data from a 2022 IFPRI survey with households sampled at the sector level.

Local Capacity Development

The UR College of Agriculture, Animal Sciences and Veterinary Medicine (CAVM) and RAB, in collaboration with Texas A&M University hosted a training workshop on the IDSS for fifty-two participants (39 male, 13 female) from February 20-23, 2023, at the UR-Busogo campus in Musanze district. Trainees included graduate students, researchers, faculty and staff from UR, RAB, the Ministry of Agriculture, non-government organization projects, private sector companies and other institutions of higher education. Two other seminars were organized to follow-up on the modeling tools and to present the preliminary research findings.

Lessons Learned

Subaward contracting and related negotiations took much longer than anticipated. Especially short-term projects need to focus on this task right from the start.

This project received a no-cost extension (NCE) until February 28, 2024. The original end date was August 31, 2023.

Developing Climate-Smart Management Strategies to Improve Sustainability of Smallholder Dairy Cattle Production Systems in Rwanda	Focus project, August 1, 2023 – January 31, 2025
PI Name & Organization: Sylvia Nyawira, Alliance Bioversity & International Center for Tropical Agriculture (Bioversity/CIAT)	**Collaborators**: Rwanda Agriculture and Animal Resources Development Board (RAB). Internationally: University of Florida (UF)
Description: This project assesses climate-smart dairy production and especially forage grasses. It will collect primary data about types of feed, carbon in soil, and dairy farming practices in three districts of Rwanda. Improved farming models will be tested and compared to typical practices.	
Location: Nyanza, Nyagatare and Burera districts	

Theory of Change and Impact Pathway

The dairy sector in Rwanda has low productivity and faces future challenges in adapting to climate change. Approaches that quantify the economic and environmental impacts of introducing improved forages alongside climate-smart agricultural practices can help dairy farmers, extension agents, and policy stakeholders adopt new practices to overcome these challenges.

Background

Poor animal feeding practices, i.e., both quality and quantity, remain a major constraint for dairy production in Rwanda. In addition, climate change is expected to have negative impacts on crop-livestock systems; hence, measures are needed for more adaptive and resilient systems. Technologies and practices that can increase dairy production and reduce the projected impacts of climate change on the dairy sector are available, such as improved forage grasses and climate-smart agricultural practices in crop systems, but their level of adoption within dairy farming systems remains low.

Objectives

The overall project goal is to assess the benefits of improved forage grasses and climate-smart agricultural practices on feed production, and to analyze their economic and environmental sustainability in smallholder dairy production systems in Nyanza, Burera, and Nyagatare districts in Rwanda. Specific objectives are to:

1. Characterize, for a range of typical dairy farming systems in Rwanda, the common feed types and associated management practices, through a combination of primary and secondary data collection and stakeholder input.
2. Improve model assessments of improved forages and maize stover production systems under climate-smart agricultural practices, through testing and evaluation of the Decision Support System for Agrotechnology Transfer (DSSAT) CROPGRO perennial forage and CERES maize models.
3. Identify CSA practices for improving dairy cattle production and nutrition through combining model simulations and on-farm field assessments, and assess their impacts on GHGs emissions, dairy production costs and income generation.
4. Develop guidelines for increasing the adoption of improved forages and climate-smart agricultural practices and disseminate them to key stakeholders.

Approach/Methodology

A participatory approach will be used to characterize the dairy farmer typologies and identify the forages and maize stover production systems, using both survey data from farmers and discussions with stakeholders in the three districts. The DSSAT perennial forage and maize models will be calibrated and evaluated using biomass and soil organic carbon data collected from on-station demonstration plots in the three districts. The evaluated models will be run under different improved management practices, including fertilizer and manure application, residue returns, and varying cutting and harvest frequencies, considering present and future climate. The potential of the improved management practices in increasing livestock feed production will be quantified by comparing the simulated biomass production against the business-as-usual, representing the typical management in the farms. The biomass data from the different scenarios together with socio-economic data from the survey will be applied in running the FarmDESIGN bioeconomic model to assess the economic benefits and trade-offs associated with the adoption of the improved technologies in the different farm typologies. Results from this work will allow us to make recommendations on practical management interventions in the smallholder dairy system that can improve production and farmer livelihoods, while increasing the sector's resilience to climate change.

Activities and Achievements

The project started mid-August. The project team has been reviewing the existing data in the three demonstration trials that will be used for the DSSAT modelling work. In particular, the biomass data for 10 cuts has been collated and the nutritional quality for the different crops in the trials for one of the cuts has been assessed. We have identified what essential data is missing and this includes soil profile data.

Local Capacity Development

None so far.

Lessons Learned

It is essential to find out what data is already available from past projects and within organizations to avoid duplication of efforts.

Deux Oeufs: Cracking the Potential of Eggs to Improve Child Growth and Development in Rwanda
Challenge project, February 1, 2022 – September 30, 2025

PI Name & Organization: Sarah McKune, University of Florida (UF)	**Collaborators**: University of Rwanda (UR), Internationally: World Vision (WV), University of Georgia (UGA)

Description: This project is designed to test the effects of maternal egg consumption during pregnancy on birth length and how this effect is different from a popular nutrient dense plant-based food in Rwanda, when compared to a typical diet.

Location: Rwanda (Nyagatare)

Theory of Change and Impact Pathway

Currently there is a lack of rigorous studies demonstrating the attribution of maternal consumption of animal-source food (ASF) on child health outcomes in low- and middle-income settings. A randomized controlled trial (RCT) to examine the effects of maternal egg consumption during pregnancy on child growth will contribute to addressing this knowledge gap. Producing rigorous evidence on the connection between maternal ASF enriched diets and child health outcomes will help to influence policy and programming designed to increase ASF consumption among vulnerable groups.

Approach/Methodology

The plan, which may need to be adapted in response to recently announced policy for improved care for pregnant women, is to use a three-arm randomized controlled trial to investigate the effect of maternal egg consumption during pregnancy on birth outcomes. All enrolled mothers in the study will receive the standard of care for pregnant women, as outlined by the Government of Rwanda; health insurance, if they are not previously covered; and engagement in additional clinical assessments during pregnancy by the research team. Participants will include mother-child dyads: pregnant women will be recruited, enrolled, and followed with their children through child age of six months.

Ensure the viability of the project in creating impacts during its lifecycle. The RFA for identifying the implementing partner was published in December 2022. Five applications were received by the January due date, four of which were considered viable. After thorough review by an internal review committee, the World Vision USA proposal was considered the most promising. One postdoc associate and one research coordinator were hired to assist with the project related activities. UF, World Vision, and the University of Rwanda (UR) maintained consistent engagement throughout the formative research process and have worked together to produce the study protocol, which was submitted to the Rwanda National Ethics Committee, RNEC (September 15, 2023) and to the UF Institutional Review Board on October 3, 2023.

Conduct formative research to create a system for effectively implementing the RCT. The study team conducted formative research in Nyagatare district from July through August 2023. From this research, the study team was able to determine the viability of the study, dietary and health practices of women in the communities, and whether the community would be receptive to the study as conceptualized and designed. Preliminary results from the formative research indicate that the study will be well received by the community. Women in the catchment area reported not to eat ASF despite the commonly held belief that those in Nyagatare district have a high level of ASF consumption. The formative research team also noted that the consumption of other intervention food (Sosoma) was very low among pregnant women. Women in the communities, including Community Health Workers (CHW), are aware of the nutritional benefits of eggs and seem eager to participate in the study. Formative research also led to the narrowing of catchment areas to Ndama and Karangazi Health Centers due to the high rates of stunting, likelihood of participation, and the need and ability to recruit participants at the necessary enrollment rate to reach the target population. The study site also identified an improved health post that can be used to recruit additional pregnant women in the study. From the formative research, the study team was able to refine the study activities and methods, recruitment strategies, timeline, and outcomes. Based on these results, the team collaboratively drafted the first full study protocol. Once all ethical approvals are obtained, the study team will be able to begin recruitment of pregnant women, which is currently targeted for Q2. Partnership between WV, UR, and UF led to reanalysis of sample size calculations and other implementation considerations, which ultimately led to an increase in sample size from 600 women to 1300 women. This change required significant modification of the protocol proposed initially by WV. These changes were confirmed during formative research and reflected in the protocol ultimately submitted to RNEC. However, there is no significant change to the overall research scope of the project submitted and approved by USAID.

Local Capacity Development

To initiate capacity development as soon as the project begins, the study team has begun to engage local partners, including local leaders in Nyagatare, the Rwanda Biomedical Centre (RBC), National Child Development Agency (NCDA), Rwanda Agriculture Board (RAB), and University of Rwanda (UR). One PhD student (woman) from the UR will be engaged in the project. That student will be supported by the project and will utilize the project efforts/research as part of her PhD.

Lessons Learned

The formative research revealed that access to health centers both transport availability and cost is a challenge for the mothers. The project team is assessing various options to overcome this situation.

Livestock Production & Disease Management: **Livestock Production Component**	
AOI 1a, October 1, 2020 – September 30, 2025	
PI Name & Institution: Adegbola Adesogan, Geoffrey E. Dahl, University of Florida (UF)	**Collaborators:** Diwakar Vyas, UF
Description: Study the main factors contributing to high cost of livestock-based food prices as well as determine the efficacy of using tools to reduce production costs, increase farm profits, and reduce food prices.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and **Rwanda**	

Activities and Achievements

Assessment & use of RFDAAT. The assessment report on the efficacy of the Excel-based Rwanda Dairy Farm Assessment and Advisory Tool (RDFAAT), that was used to train to public and private veterinarians and extension personnel in 2018 and 2022, was submitted to the Rwanda Agriculture and Animal Resources Development Board (RAB) in Q4, FY 2023. Reported benefits included the immediate, farm level feedback on how to improve milk quality and output. Limitations included a lack of access to the hardware to support the spreadsheet use, the length of the assessment itself, and poor record keeping among farmers. An important recommendation was to develop a smartphone app version of the tool which should also include other features such as ration balancing to accelerate adoption and allow greater dissemination in the dairy sector. This was done as part of the USAID-funded LASER-PULSE project at the University of Rwanda (PI: Dr. Kizito Nishimwe) for which Dr. Dahl is a co-PI. The app, called Zirakamwa, is available for download from Google Play Store in English or Kinyarwanda.

Examine the causes of low dry season milk production in Rwanda. In Q2 FY 2023, upon RAB's request and together with RAB officials, the AOI1 leaders conducted a rapid assessment to identify the underlying causes of the reduced dry season milk production. The assessment concluded that the decreased milk production was caused by deficits of water, feed, and forage supply to the cows. These findings primarily reflect inadequate forage conservation and water harvesting and storage practices as well as lack of sufficient forage production on smallholder and commercial farms. Recommendations include: 1) to build capacity of actors on optimal diets for dairy cows and best watering, feeding and forage production and conservation practices; 2) increase awareness of the government's subsidy program for water retention pond dam sheets and water storage tanks; 3) promote strategic dietary supplementation with agro-industrial by-products and concentrates, and 4) incentivize commercial forage production. The team proposed to support RAB to develop a strategy to address low dry season milk production during implementation of the Rwanda Dairy Development Project (Phase II) project in FY 2024. An initial step will be to train trainers to use the Zirakamwa app in Q1 FY 2024.

Present evidence to key stakeholders on the need to reduce and harmonize milk aflatoxin M1 standards for Africa. The Partnership for Aflatoxin Control in Africa (PACA), African Union Commission (AUC), asked the LSIL ME for additional evidence for presenting a compelling argument to review and harmonize milk aflatoxin M1 standards in Africa following the FY 2022 publication on aflatoxin M1 in milk (https://doi.org/10.1093/ajcn/nqac033). LSIL faculty provided PACA officials several supporting documents and supported them in developing a compelling presentation on the need to update milk aflatoxin M1 standards in Africa. The presentation was given to the African Organization for Standardisation (ARSO) Technical Committee on Milk and Milk Products and the New Partnership for Africa's Development (NEPAD) / AU Development Agency on September 21, 2023. The presentation proposed a harmonized standard of 5 µg/kg for milk aflatoxin M1 instead of the US FDA and European Union standards used in African countries, which are 0.5 and 0.05 µg/kg, respectively. The ARSO and NEPAD officials resolved to consider the proposal further and to issue a formal response.

Forage convening targeting donors. LSIL research (both USAID and Bill & Melinda Gates Foundation- funded) shows the contrast between the poor state of forage production and market systems in Feed the Future countries, and the potential of improved forage to contribute to climate adaptation and mitigation, improved ASF production and consumption, women's empowerment, and smallholder resilience. Discussions on this topic with USAID officials triggered the convening of a forage convening targeting multiple donors on November 30, 2023 in Washington DC. Several invited donor or funding agency representatives, non-governmental organizations (NGOs), researchers, and invited speakers have agreed to participate, and planning is ongoing.

Local Capacity Development

One student (female) from the UF Masters in Development Practice (MDP) defended her thesis in Q3 based on the RDFAAT assessment she conducted.

Lessons Learned

Assessment of stakeholder perceptions about introduced technologies can be very instructive in refining such technologies and improving their utility for the target audience.

Livestock Production & Disease Management: **Disease Management Component**	
	AOI 1b, October 1, 2020 – September 30, 2025
PI Name & Institution: Jorge Hernandez, University of Florida (UF)	**Collaborators: N/A**
Description: This project aims to improve disease management practices as well as estimating the economic impacts of diseases and mortality on livestock production and revenue at the household, village, regional, and national levels.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and **Rwanda**	

Activities and Achievements

A key activity for this AOI is the research project titled "Investing in Rwanda's Disease Management and Trade of Animals and Animal Products, Human Health and Nutrition, and the Research Workforce".

Systematic review of economic assessments for brucellosis control interventions in livestock populations: This research was conducted and reported on in FY 2022; the corresponding manuscript was published in Preventive Veterinary Medicine in April 2023 (https://doi.org/10.1016/j.prevetmed.2023.105878). Results from the systematic reviewed revealed that vaccination alone was cost-effective, but test-and-slaughter was not, for brucellosis control in selected livestock populations in selected countries (e.g., Brazil, India, Iraq, Mexico, Mongolia, Spain, Turkey, and USA). Vaccination in combination with test-and-slaughter produced profitable or nonprofitable economic outcomes. While most studies reported the cost and benefits of implementing brucellosis control interventions, few studies explained socio-economic consequences of economic outcomes, when acting, or failing to act, on selected interventions in livestock populations.

Estimate costs and benefits from adopting an enhanced vaccination program for brucellosis control in cattle: The second study estimates costs and benefits in different farm systems (zero-grazing, semi-intensive, pastoral) - where all female calves are vaccinated against *Brucella spp.* infection. Preliminary results focused on zero-grazing cattle indicate that although the baseline prevalence of brucellosis decreased from 5% to 1.2% after 20 years of intervention, the enhanced vaccination program is not cost effective (benefit cost ratio was less than 1). The economic model in zero grazing cattle is still under revision. A final model will measure and compare costs and benefits of the proposed enhanced vaccination program between cattle in zero-grazing, pastoral, and semi-intensive farm systems for selected intervention periods until the baseline prevalence is decreased to 1% (when eradication strategies considered feasible and acceptable, such as test-and-slaughter, can be implemented).

Estimate the prevalence of and identify socioeconomic factors and biosecurity measures (lack of) associated with dairy farms engaged in informal trade of milk. The geographic focus of this study is the Eastern Province, Rwanda. A PhD student is currently in Rwanda to conduct field research for four months.

Local Capacity Development

One male Rwandan veterinarian is enrolled in a PhD program in veterinary medical sciences at the University of Florida's College of Veterinary Medicine. He has successfully completed six semesters of education and training. He successfully presented and passed his Qualifying Exam in Spring 2023, and he is on track for graduation in Summer 2025.

Lessons Learned

Nothing to report.

Note: On August 27, USAID awarded LSIL a $2 million Associate Award "One Health Approaches to Mitigate Brucellosis" (2023-2026) for which Dr. Hernandez will act as the PI and will expand the work described above.

Human Health, Food Safety, Diets & Nutrition	
	AOI 2, Oct. 1, 2020 – September 30, 2025
PI Name & Institution: Arie Havelaar and Sarah McKune, University of Florida (UF)	**Collaborators:** N/A
Description: This AOI focuses on safe livestock production and food safety as well as ASF consumption, diet and adequacy as possible contributors to child growth. In smallholder livestock systems, these two factors are intimately connected and finding the right balance between benefits and risks of animal ownership is considered a key challenge to improve nutritional outcomes of infants and young children.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and Rwanda	

Activities and Achievements

Work was focused on support for Phase II subaward projects, design of *Un Oeuf* follow-up activities, facilitation of dialogues surrounding fair authorship and Dr. Havelaar engaged with the African Union and the Ethiopian Public Health Institute (EPHI) regarding risk-based standards for aflatoxin M1 in milk in Africa (see above).

Support subaward projects.

PI Wu, Ethiopia: McKune shared the R code to analyze Women Empowerment Index in Agriculture (WEIA) data and agreed to collaborate on gender analysis outcomes; if the gender differences exist, a follow up qualitative study will be considered. McKune agreed to review findings from the formative research and will support the survey validation for considering fasting practices of target population.

PI Stringer, Ethiopia: McKune and the PI discussed synergies and lessons learned between the newly funded project in Ethiopia and the completed *Un Oeuf* study in Burkina Faso. Specifically, elements of study design and recruitment specific to cluster randomized controlled trials was discussed. Sampling frames and strategies ultimately used in the *Un Oeuf* project were shared, including recommendations for formative research.

PI Dione, Burkina Faso: He agreed to share the survey tool to solicit feedback on indicators of diarrhea, proximity to animals, and nutrition. The CAGED survey and certain lab protocols were shared. Dione will follow up with Dr. McKune if he wants access to other resources.

PI Umutoni, Niger: Materials currently in development at UF in conjunction with another project to evaluate resilience in the target population of Niger (Zinder) were shared with her. She agreed to continue reflecting on any possibility of improving the human health/nutritional impact of the overall study, including small side projects such as those supporting student research

***Un Oeuf* follow-up activities.** Because of the further deteriorating security situation around Kaya (Sanmatenga province) it will not be possible for UF faculty or students to travel to Burkina Faso to follow-up on poultry and child health outcomes associated with the *Un Oeuf* Project. Therefore, the research will be done entirely by the in-country INERA team, who were involved in Phase I activities. The INERA co-PI is optimistic that data collection is viable by phone with the mothers previously enrolled, and she has sought and secured permission from the ministry managing the situation of internally displaced people in Kaya to allow INERA to proceed with trying to contact the women. A subaward proposal is under development and will be submitted to USAID for approval in Q1 FY 2024.

Fair/equitable authorship. This topic was a major item of discussion during the CAGED data analysis workshop in September 2022. These discussions and the fact that both co-leads are part of the LSIL publications committee have led to broader engagement in both on- and off-campus discussions about equitable partnerships in global health research. These include discussions at the Bill & Melinda Gates Foundation's Convening of the Nutrition Food System projects in London in March 2023; keynote and subsequent discussion at the Graduate Student Research Day event at UF. A small dataset has been created to describe all LSIL peer-reviewed publications with indicators including first author's affiliation and nationality and whether in-country partners are included as authors. These data were used to generate discussions at partner meetings in Ethiopia (May), Burkina Faso and Niger (June), which were well received.

Niger: Dr. McKune presented findings on women's empowerment and behavior change from the *Un Oeuf* study at the IP meeting in Niger in May. The USAID Mission representative expressed interested and facilitated a meeting with the Chief of Party and Deputy Chief of Party for the USAID/Niger funded Yalwa Activity. Dr. McKune shared extensive materials developed through the *Un Oeuf* project (flipbooks), LCD efforts (Eggs for All book), and the IDRC project (training materials).

Local Capacity Development

Dr. Havelaar developed a module on data management which was presented at the IP meetings in Ethiopia, Niger, and Burkina Faso. An online version will be recorded in Q1 FY 2024 and will be made available through the LSIL Academy. The AOI2 efforts were supported by a Master in Public Health (MPH) student (female) from Kansas State University.

Lessons Learned

Nothing to report.

Markets & Innovation Translation	
	AOI 3, Oct. 1, 2020 – September 30, 2025
PI Name & Institution: Conner Mullally, University of Florida (UF)	**Collaborators:** Heifer Project Nepal (HPN), University of Georgia (UGA)
Description: This AOI addresses challenges beyond the farmgate, namely market access and performance, and pricing of ASF and livestock. This AOI will also address research on scaling pathways to ensure that generated innovations reach the target users.	
Location: Burkina Faso, Ethiopia, **Nepal**, Niger, and Rwanda	

Activities and Achievements

Design and evaluate a digital Mentoring and Continuing Education platform:

This is the main activity for this AOI and is implemented in coordination with Heifer Project Nepal (HPN). The team will develop and test a tablet or smartphone-based digital platform that includes continuing education and mentoring tools for Community Animal Health Workers (CAHWs) serving cooperatives in HPN's project area, while also leveraging the personal relationships CAHWs have with their clients to expand cooperative marketing using an additional digital tool. The continuing education platform will be called the digital Mentoring and Continuing Education platform (dMCE) while the marketing tool is known as the Virtual Collection Center (VCC). Complementary research funded by the Abdul Lateef Jamil Poverty Action Lab (J-PAL) to pilot an updated VCC helped shed light on appropriate models for implementation based on current interactions with the cooperatives in HPN's project area.

The cooperatives vary widely with respect to how streamlined and professionalized their goat marketing activities are, and the extent to which the CAHWs would be an optimal choice to serve as marketing agents. Rather than forcing the CAHW model on the cooperatives, the team started a co-design process for the best scheme to collect goat inventory data and coordinate collective sales. The VCC will be a central part of any scheme. In some cooperatives, the CAHWs are the best candidates to manage it, whereas in others, the cooperatives have designated other personnel to manage inventory data management and sales, or there may be other individuals who are more central to social networks than CAHWs, and therefore make more sense to serve as a point of contact between the cooperative and its members. The pilot for the VCC mentioned above revealed that some livestock cooperatives in HPN's program area have already professionalized and somewhat streamlined management of livestock inventory and collective marketing activities. This was perhaps less surprising than reassuring, but it underscores that interventions to build up local institutions like cooperatives should be flexible enough to accommodate the heterogeneity of those institutions. Based on qualitative research during LSIL Phase I, the PI and research collaborators expected that a model that emphasized CAHWs as marketing agents would be optimal, but the current research showed that more flexibility was required. Although supported by J-PAL rather than USAID, the VCC pilot mentioned above will provide the foundation for USAID-funded activities set to begin in Q1 FY 2024. During the pilot, participating cooperatives have been trained in the use of the VCC and worked with HPN as well as the U.S.-based research team to develop their ability to manage livestock inventory and coordinate sales. Whether these efforts will lead to changes in practices among the cooperatives remains to be seen. The PI expects women to benefit from activities planned under this AOI given that the members of livestock cooperatives in HPN's project area are women.

Support subawardees and the ME on issues related to markets and innovation translation: Dr. Mullally supported the drafting of a Request for Applications (RFA) related to scaling (see section VI below). He contributed to all three parts of the LSIL Academy webinar-based course on "Developing an Innovation Perspective". He also co-led the Market Analysis for Pastoralists project (MAP) (more below).

Other activities conducted in FY 2023: While there are several areas of study with a rich literature related to crop agriculture but little written about livestock production in low-income countries. There are many studies about the use of information technology to support crop farmers in developing countries (e.g., by providing extension or price information) that use randomized control trials. Conversations with Mercy Corps and field work carried out during MAP suggests that similar efforts are underway for livestock. Several countries also have market price information systems that cover livestock, including Ethiopia, Burkina Faso, Mali, and perhaps others. But a review of the literature, co-authored by the AOI Lead and published in Global Food Security (https://doi.org/10.1016/j.gfs.2023.100704) uncovered no randomized control trials of these tools for livestock. Even economic studies of the issue of conflict, which should put livestock front and center given the prevalence of farmer-herder conflict and the potential role of livestock as a buffer against conflict's effects, have tended to focus on implications for crop agriculture (see for example: https://doi.org/10.1093/erae/jbaa022).

Lessons Learned

The envisioned model where CAHWs would serve as marketing agents for livestock cooperatives seems appropriate for some cooperatives but not for others. While the PI and research collaborators had envisioned an intervention that bundled multiple digital tools for CAHWs into one platform, the appropriate marketing model will vary from cooperative to cooperative depending on how collective sales and inventory tracking are currently managed. Development of CAHWs will continue to be an emphasis through the use of the proposed digital Mentoring and Continuing Education platform, but whether to expand the role of CAHWs to include livestock marketing will be decided on a case-by-case basis.

Local Capacity Development	
	CCT, October 1, 2020 – September 30, 2025
PI Name & Institution: Sandra Russo and Nargiza Ludgate, University of Florida (UF)	**Collaborators:** N/A
Description: Efforts will focus on strengthening capabilities of various livestock research organizations (collective ability) and competencies (of individuals within the broader research organization system) and apply LCD systems-wide approaches to engage policy and key decision makers to support and sustain changes in the system.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and Rwanda	

Activities and Achievements

Engage local partners and stakeholders (including private sector) to play leading roles in strengthening the livestock research systems in target countries. Nine proposals were submitted in response to the LCD specific request for applications (RFA), of which seven were selected for funding. After notification, we engaged prospective LCD project teams in one-on-one consultations to help them refine their technical (LCD) approach, and associated budget in preparation for submission of the proposal package for USAID approval. We continued engaging the LCD project teams in one-on-one consultations to change their project budgets to milestone-based budgets as their subaward agreements are converted into Fixed Price agreements.

Support the LCD pilot interventions in target countries. A female student from the UF Master's in Sustainable Development Program (MDP) developed together with the MEL specialist an LCD monitoring, evaluation and learning (MEL) framework to measure the impact of LCD interventions of LCD projects in target countries. The student conducted baseline data collection in Nepal and Rwanda in Q3 FY 2023.

Support leading research and higher education organizations in target countries to take responsibility for coordinating LCD activities, providing peer-to-peer mentoring, facilitating policy dialogues, and establishing and contributing to learning networks around LCD issues. The LCD team worked with the Gender and Youth Crosscutting Theme (CCT) Leader to help LCD consortium projects develop Gender and Youth competitive award guidelines to recruit host country students to design and conduct gender and youth Entrepreneurship in livestock related research. Guidelines have been developed and tested in Ethiopia and shared for use by LCD consortium projects in Rwanda, Nepal and Burkina Faso.

Lesson Academy. In Q4 collaboration with the UF Libraries was resumed to develop another series of online webinars focused on Publishing Best Practices. This webinar series consists of six webinars on different topics. The first webinar will be held in early Q1 FY 2024.

Lessons Learned

Local organizations, including the public universities that are the designated recipients of the LCD awards, did not have the financial resources to implement externally funded projects on a cost-reimbursement basis. The University of Florida developed a standard operating procedure for fixed price agreements to overcome this challenge. The LCD project teams have been exceptionally cooperative and flexible in taking this approach and are eager to start activities in FY 2024.

Note: Co-Lead Sandra Russo retired in May 2023.

	CCT: October 1, 2020 – September 30, 2025
PI Name & Institution: Kathleen Colverson, University of Florida (UF)	**Collaborators:** N/A

Description: Support research efforts to better understand access and control over productive resources as well as the benefits from livestock production, processing and marketing. We pursue an intersectional approach that considers gender and age as well as other factors that limit opportunities for individuals in the livestock sector, such as caste, race, religion, education, employment, and socio-economic status.
Location: Burkina Faso, **Ethiopia**, **Nepal**, Niger, and **Rwanda**

Activities and Achievements

Better understand drivers and incentives for involving women and youth in productive livestock value chains. Dr. Colverson implemented the mini-grant process to support graduate level research on "Barriers and Opportunities for Youth Entrepreneurship in Small Livestock Value Chains" in Ethiopia, Rwanda and Nepal in close coordination with the CCT for LCD, as these grants are integrated into specific LCD subawards in these countries as the most cost-effective approach and to reduce administrative burdens. The G&Y lead will co-supervise graduate students from three partner universities in Ethiopia, Rwanda and Nepal on youth entrepreneurship. Two journal articles were published in collaboration with LSIL subaward partners, namely: (1) Farnworth, C.R., Jumba, H., Otieno, P., Galie, A., Ouma, E., Flax, V., Schreiner, M., Colverson, K. 2023. Gender roles and masculinities in leveraging milk for household nutrition: evidence from two districts in Rwanda". Food Policy. Vol. 118, July 2023 (https://doi.org/10.1016/j.foodpol.2023.102486); and (2) Flax, V., Ouma, E., Schreiner, M., Ufitinema, A.,Niyonzima, E., Colverson, K.E., Galie, A. 2023. "Engaging fathers to support child nutrition increases frequency of children's animal source food consumption in Rwanda". PLOS ONE, (https://doi.org/10.1371/journal.pone.0283813).

Support subawardees in conceptualizing gender and youth issues in designing and carrying out research. Dr. Colverson developed and facilitated workshops in Ethiopia and Rwanda to train Co-PIs, students and subaward partners on "Integrating Gender and Youth into the Pig Value Chain" (Rwanda) and "Integrating Gender and Youth into the Smallholder Poultry Value Chain" (Ethiopia). Research partners and graduate students were trained in research data collection in respective livestock value chains related to gender and youth roles and responsibilities.

Local Capacity Development. As part of the LSIL Academy, Dr. Colverson hosted four webinars on "Facilitating Learning for Diverse Audiences" This course is designed to assists PIs and subaward partners to develop more inclusive, gender sensitive and youth appropriate materials and training events.

Lessons Learned

Good coordination with the PI and Co-PIs as well as LSIL coordinator is crucial to ensure that planned activities in country are timely and the in-country teams have the time and funds to successfully engage in the work.

Enabling Environment	
	CCT, October 1, 2020 – September 30, 2025
PI Name & Institution: Renata Serra, University of Florida (UF)	**Collaborators:** N/A
Description: We work with diverse stakeholders in the target countries to identify and address knowledge gaps, promote effective mechanisms for dialogue and consultation, and convene engaging platforms for information and knowledge sharing to support the formulation or implementation of policies that improve the performance and sustainability of livestock systems.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and Rwanda	

Activities and Achievements

Support subawardees on issues related to the enabling environment: In Q4 the team created the slide decks and video recordings for the new free online course, titled "Producing Effective Policy Briefs", in English and French. This course, taught by CCT Lead, Dr. Serra and Research Assistant Pierre William Blanc, is now available through the UF/IFAS Canvas online learning platform (link here). The course was created for LSIL subawardees to equip them with the basic and fundamental elements to be able to produce effective policy briefs from their projects and it is generally relevant for researchers in the organizations that LSIL collaborates with. Dr. Serra contributed to the overall organization of the Developing an Innovation Perspective four-part webinar series for the LSIL Academy. The latter is offered to LSIL sub-awardees to provide them with knowledge and skills that can enhance the quality or impact of their projects. As part of the LSIL Academy, Renata prepared material for, and led, the second webinar titled "*Leading to impact in ways that will matter to people and planet*", which shared recent research conducted on development-oriented scaling. The session was offered on July 29 and was attended by 18 participants.

Support the ME as well as other AOIs and CCTs in engaging with diverse stakeholders in the private and public sectors: Dr. Serra, participated in the IP in Niger in Q4 and presented results from network analysis research conducted in Niger in Phase I. The session was attended by over 35 stakeholders of Niger's livestock sector. The lecture was very well received and led to a very productive discussion afterwards. This confirms the importance of sustaining these efforts as avenues that contribute to greater knowledge of, and interest in, LSIL activity by Niger's stakeholders.

Contribute new research evidence on how stakeholder engagement influences livestock policy processes and which forms of engagements are more likely to contribute to enabling environments for sustainable livestock systems: Limited progress was made in this area, mainly because of delays in the execution of subawards. One form of engagement that enhanced this objective was a session during IP meeting in (see above). Since the coup d'état and consequent political crisis in Niger will make further data collection in this country unlikely, the EE CCT will focus its effort and continue working in Rwanda. In Q4, an initial meeting with the Rwanda country coordinator, Felix Ngamije, took place to discuss ways for future engagement of stakeholders in the focus and reach projects.

Lessons Learned

The positive reception of the EE presentation in Niger confirms research focused on stakeholder perceptions of the enabling environment for livestock research and policies is valuable and of interest to stakeholders. Also, considering the additional synergies with ME efforts at evaluating LSIL processes and activities, this is a confirmation of the need to put more effort (and human resources) to pursue EE CTT future research plans.

Future Livestock Systems & Resilience	
	CCT, October 1, 2020 – September 30, 2025
PI Name & Institution: Greg Kiker, University of Florida (UF)	**Collaborators:** United States Food and Drug Administration
Description: Future Livestock Systems research explores the transition from more vulnerable livestock systems, which struggle to address increased demands for food, to systems that foster equitable wealth, food security, and nutrition. Its modeling and analytical tools are useful to evaluate technologies and inform management and policy scenarios into the future. With information based on analysis of complex local to regional choices, policymakers and other stakeholders can seek solutions to meet the needs of dynamic populations and environmental conditions.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and Rwanda	

Activities and Achievements

Resilient Pastoralism and Forage Production into the Future. Using leveraged funds from the USDA-Economic Research Service, the G-Range Global Rangeland Model has been used to simulate monthly future rangeland conditions (including vegetation growth, soil fertility and forage consumption) for Africa and global areas at 50km² grid resolutions. The monthly rangeland simulations range from 1970 through 2070 and have been combined with the 2015 estimate of global cattle distribution as well as with production algorithms to estimate meat and milk yields (kg/head and total kg/grid) for subsistence, informal and commercial production practices. Additional efforts link GHG emissions from these various production practices and to simulate the effects of Climate Smart Agriculture practices. The G-Range and livestock production results have been linked with the Global Trade Analysis Project's (GTAP) Computable General Equilibrium Model to estimate potential climate change effects on national economies across Africa. These models have highlighted both challenges and opportunities across global rangelands. Challenges include systematic and pervasive declines in grass biomass yields occurring across west Africa from 2040 through 2070 with mixed results across eastern and southern Africa. While all simulations vary with GCM/RCP combinations, our results show opportunities to mitigate negative results through adaptive Climate-Smart Agricultural practices. A seminar on "Grid-Based Modeling 101: Using the G-Range & SAVANNA Landscape Models" was presented on April 20, 2023. The recording has been viewed 74 times since then. Recent modification to G-Range include a localized Africa-wide version (Af-Range). Af-Range provides a high detail and local monthly rangeland simulation of the continent of Africa at a 10 km² grid resolution with higher ecosystem detail in landscapes. Based in part on Phase I research and in collaboration with the Feed the Future Small Scale Irrigation Lab, a manuscript on "Simulated economic and nutritional impacts of irrigated fodder and crossbred cows on farm households in southern Ethiopia" was published in World Development Perspectives (Bizimana et al., https://doi.org/10.1016/j.wdp.2023.100517).

Capacity Development with Open-Access/Open-Source Model Training. Using leveraged efforts from a NASA-SERVIR project (http://galup.cersgis.org) we are implementing a GitHub-based training platform to link livestock researchers to freely available models and training (http://galup.cersgis.org/training). So far, NASA-SERVIR effort has trained 70+ participants in Geographic Information System (GIS) and land use planning tools in Ghana with ongoing operations in livestock/conservation/land use planning underway with the Chobe District Land Board in Botswana. In Q4 we started preparing to use this cross-cutting effort to create an evergreen training and open-source code/parameter access system so that both students and professionals can undertake rangeland modeling training at their own pace and schedule. This training effort coincides with global efforts to connect rangeland scientists and policy analysts with grazing model builders to allow beneficial interactions and further research to form in the years ahead. This will be part of the LSIL Academy.

Lessons Learned

Within systems and resilience analysis, there are many inter-disciplinary skills to be strengthened and we have found that careful selection tends to achieve higher results in terms of both students finishing training and attaining subsequent professional benefits from the training. Connecting professionals and training is a challenging effort in that educational goals and professional development must be closely aligned. We have found it is better to train a handful of strongly interested and connected professionals rather than large numbers of weakly interested or disconnected students. As there are many related projects doing similar research and training, we have found that leveraging these funding sources and modeling networks allows a higher impact tool to be developed and higher quality of training materials and platforms to be utilized. Within the modeling and future systems community, sustained and complementary networks are to be encouraged and nurtured for many years after a training event.

Monitoring and Evaluation	
	October 1, 2020 – September 30, 2025
PI Names & Institution: Erica Odera and Sebastian Galindo, University of Florida (UF)	**Collaborators:** n.a.
Description: Monitoring and Evaluation is a central function of the Livestock Systems Innovation Lab. We design and collect monitoring data to track subawardee project progress and conduct social science research on the impact of the LSIL portfolio.	
Location: Burkina Faso, Ethiopia, Nepal, Niger, and Rwanda	

Activities and Accomplishments

Site Visits to Niger and Burkina Faso. Dr. Erica Odera travelled to Niger and Burkina Faso in June 2023 to conduct site visits. Two facilitated meetings with farmers occurred in Niger. The first was in Baleyara village, one of the sites for the Phase II Reach project. Approximately 60 farmers attended to discuss current challenges and opportunities in the livestock sector, changes over time in their village, and their perceptions of engagement in the ICRISAT-led Reach Project. The second meeting occurred in Niamey with a group of villagers (6 male, 4 female) who traveled from Torodi and had been involved in sheep fattening trainings through the Phase I ICRISAT project. The discussion examined which behaviors farmers sustained resulting from their engaged in the project. In Burkina Faso, a site visit occurred to Korisimoro village. A meeting and facilitated discussion occurred with 5 farmers (3 male, 2 female) who were part of a farming cooperative. They had been part of the Phase I ICRISAT project and participated in sheep fattening and dual-purpose cropping. The purpose of this meeting was to understand whether practices which were introduced through this project were still being maintained and what benefits or challenges were experienced. Also, a meeting with a student (male) engaged the Phase I guinea fowl productivity Focus Project in Burkina Faso occurred to learn about his experiences, current and future career interests, and his perceptions of the livestock sector challenges in Burkina Faso.

Evaluation Studies. Two evaluation studies were completed this year. A "lessons learned" survey was carried out with all project personnel from Phase 1 projects. Participants were asked about their perceptions of the support they received from the ME, reflections on their project's outcomes, and general advice to other research for development projects. A retrospective study on the alignment of the Innovation Platform meetings to the Agricultural Innovation Systems framework was completed using interview data with LSIL staff and project documents. This study has been written as an academic manuscript and is currently under peer-review. Significant effort was devoted to activities related to assessing the impact of the Lab. The M&E team designed a portfolio analysis approach for analyzing final reports from Phase 1 projects was developed. A conceptual framework was created that integrates the Lab's theory of change with the goals of the Global Food Security strategy. Deductive codes were aligned with the elements identified in the conceptual framework. All the projects from two countries had been coded by the end of this reporting period and we have drafted a template for country reports that focus on highlighting the evidence of short- and medium-term outcomes and the contribution of those outcomes to long-term impacts.

Support for Management Entity. The M&E team shared knowledge regarding M&E results and findings with different audiences. This year Erica Odera gave six different presentations to LSIL staff and faculty about results from surveys, site visits, and other M&E topics. The M&E team improved aspects of the data collection efforts of LSIL. New modules in Piestar were created to capture the unique activities carried out by the Management Entity and project specific Environmental Monitoring forms were created to be used during field visits by country coordinators. Event evaluations are now done electronically using QR codes to aid in data quality and reduce time spent on data entry. All indicator data from Phase I across the entire LSIL portfolio has been collated, cleaned, verified, and summarized into a singular database. The evaluation team also assisted different AOIs and CCTs within the Lab with the development of data collection instruments for their different studies, and the preparation and submission of revisions to the IRB office.

Capacity development

The M&E team mentored three master's students (all female) this fiscal year. Two students carried out practicum field work with LSIL and the other serves as an M&E intern.

Lessons Learned

Farmers in both Niger and Burkina Faso are still engaged in the sheep fattening and dual-purpose crop production practices initiated in Phase I. However, the feed marketing connections established in Niger are no longer active . Farmers from Torodi, Niger reported higher crop/feed and sheep production. Crop/feed production was reported as three to four times higher when planting cowpea and millet close together and sheep prices were reported as five times higher than purchasing price when fattening practices were used. Farmers in both countries emphasized the importance of knowledge and learning as being the most motivating and important aspects they have received from project involvement. From the lessons learned survey, projects reported budget and field work challenges and felt their greatest successes were with student engagement, achieving research objectives, and building partnerships with other institutions. Recommendations from the M&E team for the ME include tailoring support around finance and communication issues and providing project management training or resources for funded projects.

g) Bill & Melinda Gates Foundation funded projects

i. EQUIP project

"EQUIP–Strengthening smallholder livestock systems for the future" strives to improve the incomes, livelihoods and nutrition of smallholder farmers. It has two areas of study: 1) increasing livestock productivity through increased supply of quality feeds (the Feed subproject), and 2) reducing stunting in young children through egg consumption and reducing enteric dysfunction through improved chicken husbandry (the CAGED subproject).

Campylobacter Genomics and Environmental Enteric Dysfunction (CAGED) subproject EQUIP project, November 27, 2017 − December 31, 2023	
PI Name & Institution: Arie Havelaar, University of Florida (UF)	**Collaborators:** Haramaya University (HU), Te Kunenga ki Pūrehuroa Massey University, Ohio State University (OSU), Washington University in St. Louis (WU)
Description: The project aims to assess the fecal-oral transmission network of *Campylobacter* bacteria in the study area and to quantify the role of livestock in this transmission. A range of microbiological methods will be used to characterize the genetic structure of *Campylobacter* population in human and livestock reservoirs. Interactions between *Campylobacter* colonization and overall gut microflora in the children against a background of the socio-demographic environment will also be evaluated.	
Location: Haramaya woreda, East Hararghe Zone, Oromia Region in Ethiopia	

Achievements

FY 23 activities focused on sample analysis, data analysis and communicating the research findings with different target audiences. This longitudinal study involved 106 infants followed from birth to just over 1 year of age in 10 kebeles of the Haramaya woreda in rural eastern Ethiopia from December 2020 to June 2022. Laboratory work at Haramaya University was completed December 31, 2022 with a focus on culturing of *Campylobacter*. Overall, 513 pure cultures have been obtained, of which 505 were from thermotolerant species. Culturing of non-thermotolerant species has been mainly unsuccessful. This might be explained by the predominance of the newly recognized species *C. infans* as detected by quantitative polymerase chain reaction (qPCR). This species, which was first described in 2020, has until now only been cultured once in the world; optimal culture conditions have not yet been established. Shipment of pure cultures and samples for environmental enteric dysfunction assessment were delayed but finally happened in Q4. At UF, species specific qPCR was completed for four species (*C. jejuni*, *C. infans*, *C. upsaliensis*, *C. lari*). *C. infans* was highly prevalent in human and soil samples and were also detected in livestock. *C. jejuni* was the most frequent species in livestock, and second in humans and soil. Metagenomic sequencing (16S rRNA gene and shotgun) has been completed in a limited number of samples, bioinformatic analysis is ongoing. The results will also guide the need to test for the presence and absence of other species by qPCR in all samples. Because of the delay in the shipment, studies are still ongoing to sequence the genomes of *Campylobacter* isolated from infants, siblings, mothers, and livestock to further elucidate transmission cycles. First sequencing results are expected in Q1 FY 2024. Based on overall results available on September 30, 2023, there are several proposed policy implications:

- Promote exclusive breastfeeding, with specific focus on appropriate pre- and postnatal counselling and encouraging colostrum feeding, while discouraging prelacteal feeding and early initiation of complementary feeding;
- Hand sanitation before breastfeeding, cooking, and infant feeding, after field work, animal contact and milking, toilet and touching baby bottoms;
- Promote boiling of milk before consumption and improve hygiene during milking with additional benefits for mastitis control;
- Reduce open defecation and contact of infants with livestock or their droppings.

The UF based research team is working in collaboration with HU to develop an outreach plan through HU's extension services that addresses some of these areas of need. Specifically, an information, communication, and education campaign is being developed, in collaboration with stakeholders in and around HU (NGOs and others) to streamline messaging around infant and young child feeding practices, which will address specifically prelacteal feeding, complementary feeding, and exclusive breastfeeding practices.

Capacity Development: Two students at UF successfully defended their PhD theses in Q3 and one in Q4. Major findings were that risk factors for Campylobacter colonization were food-related (pre-lacteal feeding, complementary food – specifically raw milk, food insecurity). While the bacteria were ubiquitous in all samples, there were geographic patterns (hotspots) with areas of intermediate elevation, vegetation index and slope more suitable for colonization than other areas. A Markov Chain model was developed to quantify the acquisition and clearance dynamics of the bacteria in infants, based on MAL-ED data. Application of this model to CAGED data suggested that while acquisition rates increased during the first year of life, clearance rates reduced strongly; after 4 months acquisition was faster than clearance resulting in extremely high prevalence levels. Additional analysis exploring the effects of livestock ownership and/or khat production on child nutritional outcomes found no significant associations. These analyses did find that women empowered in the leadership domain of the AWEAI were three times more likely to have a child who consumed ASF, and that women empowered in time domain of

AWEAI were almost 3 times as likely to have a stunted child than those who were disempowered in the time domain. Finally, in-depth analysis of women's khat production over the timespan of the CAGED project found a significant increase from Dec 2020 to June 2022. These analyses also found that although women's engagement in khat production increased, it was not statistically associated with child nutritional/growth outcomes; however, women's empowerment was. Specifically, overall women's empowerment was significantly associated with higher LAZ scores. In addition, when understood across time rather than cross sectionally, higher engagement in khat over time was associated with lower LAZ scores. Women's empowerment was also associated with greater WAZ, cross-sectionally and over time. Interestingly, livestock ownership (as indicated by Tropical Livestock Unit) was significantly associated with WLZ, but khat production and women's empowerment was not.

In Q4, Dr. Havelaar traveled to Ethiopia to work with colleagues on multiple presentations. The team expects to submit seven manuscripts by December 2023. Analysis and reporting of the project results continue, even though many team members, both in Ethiopia and in the US, are no longer funded from the project and have moved to other positions. Building on skills developed by engaging in the project, two team members in Ethiopia have been offered permanent positions at Haramaya University as lecturer or researcher or have successfully applied for a PhD position elsewhere. US based graduate students have found post-doc positions and the scientific laboratory manager is now enrolled as a PhD student at the University of Florida.

Lesson Learned

Adaptive management continued to be needed in this fiscal year, with a focus on administrative and logistic challenges of shipping biological samples to the USA on dry ice.

Feed Subproject	
	EQUIP project, November 27, 2017 – December 31, 2023
PI Name & Institution: Adegbola Adesogan, University of Florida (UF)	**Collaborators:** See below.
Description: The project aims to: 1) in Ethiopia, increase dairy cattle productivity through better quality feeding based on improved understanding of the availability and nutritional value of locally available feed resources, the nutritional requirements of local breeds as well as the interaction between feeding and genetics; 2) in Burkina Faso, increase small ruminant productivity through better quality feeding based on improved understanding of the availability and nutritional value of locally available and imported feed resources as well as improved feeding management to match the nutritional requirements of local breeds.	
Location: Ethiopia: Tigray, Oromia, Amhara, former Southern Nations, Nationalities, and Peoples (SNNP) Regions; Burkina Faso: Sahel, Central and Hauts-Bassins Regions.	

Achievements. These are described under the following five subcomponents.

Subcomponent 1: Inventory of feed resources through a landscape analysis, to document the quantities, nutritional qualities and prices, availability and accessibility of feeds that can be used to improve livestock productivity	
PI Name & Institution: For Ethiopia: Dr. Adugna Tolera, Hawassa University For Burkina Faso: Dr. Amole Tunde, International Livestock Research Institute (ILRI)	**Collaborators:** For Ethiopia: Ethiopian Institute for Agricultural Research (EIAR), ILRI For Burkina Faso: Environmental and Agricultural Research Institute (*Institute de l'Environnement et de Recherche Agricole* [INERA])

Ethiopia: The Hawassa University team has updated the Ethiopian feed database: https://www.ethiofeedsdatabase.org.et/dataset. A comprehensive survey of agro-industrial byproducts, processed feed, and factory production has been completed. The teams were able to survey the Amhara Region despite security challenges; however, no activities took place in the Tigray Region due to the conflict.

Burkina Faso: The feed database has been updated based on comments received: https://feed-resources.herokuapp.com/fr/. The results from the feed analysis conducted at the ILRI lab in Hyderabad were incorporated into the feed database.

Subcomponent 2: Examine strategies to increase the yield, quality, and preservation of fodder with location-specific improved forages for the countries' different agroecologies	
PI Name & Institution: For Ethiopia: Dr. Fekede Feyissa, EIAR For Burkina Faso: Dr. Ken Boote, UF	**Collaborators:** For Ethiopia: Hawassa University, ILRI For Burkina Faso: INERA

Ethiopia: Experiments evaluating effects mixing densified crop residues with various ingredients on performance of cows and on seeding rate and fertilizer application effects on yield of early maturing oat varieties have been completed. A study targeting 450 farmers showed that they are "willing to pay" for forages that increase milk production, have high intake potential and are green in color. A manuscript on "best-bet" feeding interventions for enhancing dairy productivity in the central highlands of Ethiopia was published.

Burkina Faso: The last crop residue improvement experiment was completed in September 2023. Two MS students (both male) are finalizing their theses, one on crop residue improvement using urea and molasses treatment and the second one cactus trial. A manuscript on grain yield, fodder yield and nutritive value of intercrops of sorghum and cowpea is under review with *Frontiers in Animals Science*, while another one on maize-cowpea intercrops has been published in that journal.

Subcomponent 3: Determine and meet nutrient requirements of indigenous livestock with balanced rations	
PI Name & Institution:	Collaborators:
For Ethiopia and Burkina Faso: Dr. Ermias Kebreab, University of California, Davis	For Ethiopia: EIAR, Hawassa University For Burkina Faso: INERA

Ethiopia: The gas cylinder replacement for the GreenFeed machine was finally delivered to EIAR, thanks to ILRI's involvement. Unfortunately, though critical additional spare parts have been delivered to Ethiopian customs, clearing them is still proving challenging.

Burkina Faso: The assessment of CH_4 emissions from local goat breeds was completed. The Ph.D. student (male) has finalized the review of nutrient requirements of local goat and sheep breeds. An MS student (female) is writing up her thesis on methane emissions from local sheep and goat breeds and a manuscript on the energy requirement of small ruminants in the tropics has been submitted to a journal for publication.

Subcomponent 4: Improve the capacity to analyze the nutritional value of livestock feeds	
PI Name & Institution:	**Collaborators:**
For Ethiopia: Dr. Alan Duncan, ILRI For Burkina Faso: Dr. Amole Tunde, ILRI	For Ethiopia: EIAR; Bless Laboratory, Hawassa University For Burkina Faso: INERA

Ethiopia: The NIRS Community of Practice (CoP) met in Q1, and Q3, and the latter included potential users of feed analytical services. A standard operating procedure for integrating and networking the NIRS machines was developed. New NIRS equations for Desho grass and wheat bran were developed. The aflatoxin equation development using Brimrose and FOSS 5000 NIRS machines did not result in the expected/required level of precision. Articles on the evaluation of mobile NIRS for oil seed cakes, feed price-quality relationships in Ethiopia and feed markets across agroecological zones in Burkina Faso have been published in *Frontiers in Animal Science*. The first paper was by a MS student (male) who has now graduated.

Burkina Faso: The NIRS public and private partnership annual meeting took place in Ouagadougou in July 2023. Participants from research centers, universities, ministry of livestock and fisheries resources, feed millers and retailers were updated about development of new equations on minerals, vitamin and amino acid for Burkina Faso feeds. The INERA NIRS team now has full capacity in analyzing feed nutritional quality both for ruminants and monogastric feeds. NIRS services are also being provided to the private sector, mainly feed millers, and feed sellers.

Subcomponent 5: Examine effects of synergizing feed, management, and genetic interventions on milk production in Ethiopia	
PI Name & Institution:	**Collaborators:**
Dr. Bayissa Hatew, ILRI	EIAR, UF

The on-farm research activities for this component were completed in FY2022. A manuscript titled "Synergies of feed, management trainings, and genetics on milk production of dairy cows in the tropics: The case of Ethiopian smallholder farmers" was published in *Frontiers in Animal Science* . An extension paper on noug seed cake is under review by the *Ethiopian Journal of Agricultural Sciences*. The MS student (male) linked to this objective defended his thesis in July 2023.

Publication and Knowledge Dissemination

In FY23, the team published 14 peer-reviewed papers.

Capacity Development

In FY23, 7 PhD students (6 male, 1 female) and 5 MS students (3 male, 2 female) were involved in project activities. Two INERA technicians (both males) participated in a two-day training given by the NIRS expert from ICRISAT in Hyderabad, India. The training included five NIRS skill sets essential for the successful and sustained use of this technique. A training course on using ration-formulation software took place in Q3 FY 2023 in Ethiopia, with 40 participants (36 male, 4 female). Training on forage management & forage feeding practices was provided for 80 farmers (60 male, 20 female) in Q2 FY23.

Lessons Learned

- Adaptive management continued to be needed in this fiscal year as the security situation in both countries has been challenging.
- The challenges with the Greenfeed machine in Ethiopia have persisted due to delays with clearing vital parts from the customs agency. Such delays should be factored into research plans for countries with strict customs agencies in future.

ii.   Market Analysis for Pastoralists

Market Analysis for Pastoralists	
	MAP project, Sept. 30, 2021 – March 31, 2023
PI Name & Institution: Adegbola Adesogan, University of Florida (UF)	**Collaborators:** Syracuse University, Mercy Corps, Boston Consulting Group (BCG)
Description: The project aims to identify the right inclusive and innovative market interventions for pastoralists communities in Africa. Identification of such market interventions will contribute to improving the economy of pastoralists in Africa, reducing their poverty, and increasing their resilience.	
Location: Pastoral regions of Burkina Faso, Nigeria and Ethiopia.	

This project received a no-cost extension (NCE) to accommodate a high-level convening in January 2023. The outputs from the MAP project included a final report as well as a policy brief. Both documents incorporated lessons learned during the one-year duration of research for the MAP project as well as insights gleaned during a two-day convening held in Nairobi entitled "Inclusive Investment Opportunities for Unleashing the Power of the Pastoral Sector". This convening brought together representatives from the private sector, government, research, NGOs, and pastoralist communities with an interest in the future of the livestock sector in Africa.

The final report was submitted for review to the Bill & Melinda Gates Foundation. The policy brief, although not publicly available, was shared with participants of the Nairobi convening and is available upon request. The private sector and MAP both emphasize increasing the supply of appropriate credit products. The private sector emphasizes investing in infrastructure that is economically and socially balanced, while MAP recommends scaling the availability of abattoirs near production areas, including the use of mobile abattoirs, which could serve as an example of sectoral infrastructure that is economically and socially balanced. The Francophone pastoralist community recommended investments in digital systems, while MAP recommends scaling access and use of digital market linkages and virtual aggregation tools (i.e., digital platforms to facilitate collective marketing). The donor community emphasized feed markets and water while the research community cited fodder production. MAP also sees feed, fodder, and water as key areas of intervention. Where the MAP project departed from the recommendations emerging from the convening was primarily in suggesting interventions tailored to the different pastoral "archetypes". These archetypes include "highly-vulnerable" or "hanging-in" pastoralists (roughly 70% of the total based on discussions with key informants) that are disproportionately impacted by climate and political shocks, "moving-up" pastoralists (20%) likely to benefit from market interventions, and "highly-adaptive" pastoralists (10%) who have achieved relative efficiency and commercial success. These archetypes differ with respect to appropriate interventions, with hanging-in pastoralists needing sustainable pathways out of pastoralism and the other two archetypes positioned to benefit from market-focused interventions and sector-wide modernization. In particular, for "highly vulnerable" and "hanging in" pastoralists, the MAP project recommends support to engage in auxiliary livestock vocations such as fodder production, fattening, and professional herding. Transitioning to these activities would require significant efforts in extension (training) as well as ensuring access to necessary inputs.

The livestock sector may not be able to absorb all pastoralists transitioning out of livestock production or diversifying into more sustainable livelihoods, and movement into other sectors must be facilitated as well. Additional alternatives include alternative livestock keeping (e.g., poultry), production of alternative commodities (e.g., charcoal, honey), and crop agriculture. All such transitions will require heavy involvement of extension and ensuring access to key inputs. Developing pastoralists in an inclusive way may therefore require thinking outside of the livestock sector and also targeting, for example, crop agriculture input markets. Adaptive diversification and transition will require heavy investments in extension as well as development of appropriate credit products for investment in new economic activities by pastoralists exiting livestock keeping.

Other interventions, such as those that overlap with recommendations from the convening, are likely to benefit pastoralists that continue to focus on livestock production, such as moving-up and highly-adaptive pastoralists.

Overall, what emerged from the MAP project and the convening was a portrait of a sector with many challenges but also rich potential, requiring solutions that combine the efforts of different partners, including pastoralists, private sector entities, policy makers and donors.

VI. Associate Award Research Project Reports

On May 23, 2023, USAID/Haiti Mission awarded UF with an Associate Award (Cooperative Agreement #72052123LA00002) "Système d'Innovation en Production Animale (SIPA). We will report separately for this 5-year project.

On September 27, 2023, USAID awarded UF with another Associate Award (Cooperative Agreement #7200AA23LA00003) "One Health Approaches to Mitigate Brucellosis". We will report separately for this 3-year project.

VII. Human and Institutional Capacity Development

a) Short-term Training

Table 7. Summary of Short-term Trainings

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained		
			M	F	Total
Burkina Faso	To train enumerators on how to conduct focus group discussions, interviews, and qualitative data recording, and to field test these methods with smallholder producers.	Civil Society, Government	3	5	8
Burkina Faso	To equip project staff and students with an understanding of best practices in laboratory processes.	Civil Society	5	3	8
Burkina Faso	To train selected One Health Champions on how to carry out One Health approaches to poultry production.	Civil Society, Private Sector, Government	8	4	12
Burkina Faso	To train graduate students in research methodologies, research communication, and avian influenza control practices.	Civil Society	9	3	12
Burkina Faso	To train enumerators to carry out household survey data collection.	Civil Society, Government	5	5	10
Niger	To train enumerators on how to use and carry out the questionnaire designed to collect information on agro-pastoral systems from smallholder producers.	Civil Society	5	1	6
Niger	To teach participants the methods and facilitation practices needed to carry out Agro-Pastoralist Field Schools in Tillabéri, Niger.	Civil Society, Government, Smallholder Producers	6	3	9
Niger	To teach participants the methods and facilitation practices needed to carry out Agro-Pastoralist Field Schools in Maradi, Niger.	Civil Society, Government, Smallholder Producers	7	2	9
Rwanda	To train enumerators on how to use surveys to assess gender constraints in pig production and marketing.	Civil Society	2	2	4
Rwanda	To train enumerators on how to assess pig health challenges using participatory epidemiology, focus groups, and key informant interviews.	Civil Society, Government	8	6	14
Rwanda	To train enumerators on the use of the Rhomis tool for collecting farmer household baseline survey data.	Civil Society	5	5	10
Rwanda	To train civil society professionals on how to use the Gendered-Feed Assessment Tool survey.	Civil Society	10	3	13
Rwanda	To train researchers, private sector companies, and government officials on the use and application of the Integrated Decision Support Systems model.	Civil society, Private sector, Government	39	13	52
Rwanda	To train PIs and graduate students on how to integrate activities, data collection, and data analysis relevant to gender and youth within research project activities in Rwanda.	Civil Society, Government	10	5	15
Ethiopia	To train PIs and graduate students on how to integrate activities, data collection, and data analysis relevant to gender and youth within research project activities in Ethiopia	Civil Society	9	3	12
Nepal	To train community animal health workers and goat cooperative members on how to use the Virtual Collection Center goat marketing app	Private Sector, Smallholder Producers	0	83	83
		TOTAL	**131**	**146**	**277**

Table 8. Summary of Long-term Trainings

	ID#	Sex	University	Degree	Major	Program End Date	Degree Granted	Home Country
1	157	M	University of Maradi	Ph.D.	Human Nutrition	Oct/2025	N	Niger
2	160	M	Abdou Moumouni University	Bachelor	Agronomy	Dec/2023	N	Niger
3	161	M	Abdou Moumouni University	Master	Rural Economy	June/2024	N	Niger
4	162	M	Abdou Moumouni University	Master	Animal Production	Dec/2023	N	Benin
5	158	F	Kansas State University	Master	Public Health	July/2023	Y	Pakistan
6	159	F	University of Florida	Master	Animal Science	May/2024	N	Nigeria
7	153	F	University of Florida	Master	Sustainable Development Practice	May/2023	Y	Colombia
8	155	M	University of Florida	Ph.D.	Veterinary Science	Aug/2025	N	Rwanda
9	43	F	University of Florida	Ph.D.	Agricultural and Biological Engineering	Aug/2023	Y	Dominican Republic
10	163	F	University of Florida	Ph.D.	Agricultural and Biological Engineering	Aug/2023	Y	United States of America
11	164	F	University of Florida	Master	Sustainable Development Practice	May/2024	N	Indonesia
12	165	M	Joseph Ki-Zerbo University	Master	Food Engineering	April/2024	N	Burkina Faso
13	166	M	Joseph Ki-Zerbo University	Master	Food Engineering	April/2024	N	Burkina Faso
14	167	F	University Cheikh Anata Diop	Master	Epidemiology and Public Health	April/2024	N	Burkina Faso
15	168	M	Joseph Ki-Zerbo University	Ph.D.	Biochemistry and Microbiology	June/2025	N	Burkina Faso
16	169	F	Addis Ababa University	Master	Poultry Health and Management	June/2024	N	Ethiopia

c) **Institutional Development**

In FY 2023, institutional development activities were carried out with the public extension service provider in Niger (see Table 9).

Table 9. Summary of Institutional Development

Institution Name	Institution Type	Country	Description of Institutional Development
Livestock Technical Agency & Extension Services	Government Agency	Niger	The project is strengthening the capacity of the extension services agents in the Agro-Pastoralist Field Schools approach so that they can be able to guide and support farmers in their learning process. In addition, the project is strengthening farmer support systems through improved collaboration between farmers and extension services.

VIII. Innovation Transfer and Scaling Partners

a) **Plan of Action**

The LSIL ME is eager to increase the impact of the research for development work funded through LSIL. To this end, LSIL is prepared to support private sector entities to scale out livestock and/or animal source foods consumption-related innovations in LSIL target countries. Innovations considered for scaling are preferably generated through the LSIL research to date but externally generated livestock systems related innovations (alone or as a package) are also eligible. Throughout Q3 and Q4, the LSIL ME worked extensively on the RFA. This involved extensive consultation with the Director of the Feed the Future Innovation Lab for Small Scale Irrigation, as this Lab had issued a scaling RFA for which only private sector entities could apply, ILRI researchers (some of them LSIL PIs'), researchers from the USAID funded Innovation to Impact (i2i) initiative,

independent experts and the EAB Chair and members. Dissemination lists for each target country have been compiled. The scaling RFA / funding support opportunity is unique in that applicants will be private sector entities. By relying on the private sector, the RFA will encourage sustainable scaling by pushing applicants to take up innovations with demonstrated demand among potential end users, i.e., innovations with a "business case". The application process will be different than previous LSIL RFA as we will be collaborating with the University of Illinois and use the i2i learning platform at https://usaid.s4prod.com/#/ to identify applicants with the most promising innovation or innovation package. The RFA release is planned for Q1 FY 2024.

b) Steps Taken

In FY 2023, the ME hosted three Innovation Platform meetings. Participation for these day long events varied between 32 participants in Ethiopia and 41 in Niger.

Table 9. Timing and attendance data for Innovation Platform meetings held in FY 2023

Country	Date	Total # Organizations Represented	Total #Attendees*
Ethiopia	May 10, 2023	19 (including USAID/Ethiopia; 16 without those from abroad)	32 (25 without those based abroad)
Niger	June 8, 2023	22 (including USAID/Niger; 21 without those from abroad)	41 (35 without those based abroad)
Burkina Faso	June 13, 2023	19 (including USAID/Burkina Faso; 17 without those from abroad)	35 (32 without those based abroad)

The meeting in Nepal had been planned for end of July 2023 but was cancelled because of the delay in subaward project start. The meeting in Rwanda was scheduled for October 11, 2023, to coincide with the launch of the Challenge Project.

c) Partnerships Made

The LSIL is partnering with the University of Illinois on utilizing the i2i learning platform as a tool through which the applicants for the scaling RFA will be evaluated.

d) Technologies Ready to Scale

At the end of FY 2023, the Innovation Lab had 0 technologies ready to scale (see Table 10 below).
The Rwanda dairy farm assessment and advisory tool (listed as #9 in Table 10) will no longer be used as an Excel tool, instead it was merged with a feed ration balancing app, the Zirakamwa as part of the USAID-funded LASER-PULSE project (PI: Dr. Kizito Nishimwe, University of Rwanda) which also involves Dr. Dahl.

e) Technologies Transferred

At the end of FY 2023, the Innovation Lab had 0 technologies that were transferred (see Table 10 below).

f) Technologies Scaled

At the end of FY 2022, the Innovation Lab had 0 technologies that were scaled (see Table 10 below).

#	Innovation Title (i.e., tech/practice title)	PI Name	Lead Insti-tution	Innovation Category	Innovation Phase			
					Phase I: Under research	Phase 2: Under field testing	Phase 3: Made available for uptake	Phase 4: Demon-strated uptake
BURKINA FASO								
1	Integrated Educational and Training (IET) packages for improved poultry production and health in Burkina Faso	Michel Dione	ILRI	Production Systems Research	1			
2	Gender-sensitive business models for enhancing poultry value chain linkages in Burkina Faso	Michel Dione	ILRI	Production Systems Research	1			
NEPAL								
3	Virtual Collection Center and goat cooperative inventory management in Nepal	Conner Mullally	UF	Social Science Research	1			
NIGER								

#	Innovation Title (i.e., tech/practice title)	PI Name	Lead Institution	Innovation Category	Phase I: Under research	Phase 2: Under field testing	Phase 3: Made available for uptake	Phase 4: Demonstrated uptake
					Innovation Phase			
4	Intercropping of dual-purpose cereals and legumes for sustainable food and forage production in Niger	Clarisse Umutoni	ICRISAT	Production Systems Research		1		
5	Context adapted tropical forage cultivars in Niger	Clarisse Umutoni	ICRISAT	Plant and Animal Improvement Research	1			
6	Urea treatment of crop residue for small ruminant feed in Niger	Clarisse Umutoni	ICRISAT	Production Systems Research	1			
7	Silage making techniques for small scale farmers in Niger	Clarisse Umutoni	ICRISAT	Production Systems Research		1		
RWANDA								
8	Suitable forage maps production through geographical techniques and stakeholder participation in Rwanda	Raghavan Srinivasan	Texas A&M	Production Systems Research	1			
9	Rwanda dairy farm assessment and advisory tool	Adegbola Adesogan & Geoffrey Dahl	UF	Production Systems Research		1		
				TOTAL	6	3		

IX. Environmental Management and Mitigation Plan (EMMP)

Report on mitigation and monitoring activities in relation to the EMMP

1. Monitoring and mitigation conducted
Project team environmental monitoring
Projects that conducted research activities in FY 2023 implemented diverse mitigation activities as well as monitoring to ensure that mitigation measures included in their EMMP were complied with. The list below highlights the actions taken by selected projects that completed activities listed in their EMMPs in FY 2023:

Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach
Michel Dione | International Livestock Research Institute (ILRI)

Protocols for the management of animals and infectious agents were developed and IACUC and IRB approvals were secured in Q1 FY 2023. These written protocols were developed in English, and then shared in French to project partners and students. A biosafety training workshop was organized by ILRI Environmental Occupational Health and Safety (EOHS) department in Q2 in Ouagadougou, Burkina Faso. The aim of this training was to equip project staff and students with best practices in laboratory processes to minimize the risk related to exposure to biological agents both in the field and the lab. The training was attended by four men and five women. Following the training workshop, the Institutional Biosafety Committee (IBC) of ILRI issued a clearance to the project under Ref: ILRI-IBC2022-25 to start up laboratory work. ILRI IBC is registered and accredited by the National Biosafety Authority (NBA) in Kenya.

Enhancing the productivity and resilience of agro-pastoral systems, and income, food and nutrition security through market-oriented innovations in Niger
Clarisse Umutoni | International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

IRB and IACUC approvals were secured in Q1 and Q2 FY 2023, respectively. For the activities related to on farm agronomic experiments and demonstrations of dual-purpose legumes/cereals, all protocols and training materials have been produced (in French), reviewed, and shared with project personnel. Seeds and fertilizer were certified by the Ministry of Agriculture and Livestock of Niger through its General Directorate of Agriculture. Fertilizer was purchased

after USAID-approval was obtained in Q3 to purchase additional quantities as the initial estimated amount and costs were insufficient. All research sites have been inspected to ensure that the planned protocols are being followed. The project has created documentation processes on sourcing, labeling, and using fertilizer and will ensure that only trained personnel will use or apply fertilizer. The project PI and Dr. Ibrahima Abdoussalam, both from ICRISAT, carried out sites visits in Tillabéri and Maradi to ensure this compliance.

Profiting from pigs in Rwanda: Improving people's lives and livelihoods through more productive pig farming
Emily Ouma| International Livestock Research Institute

IRB clearance was obtained from the Office of Director or Research and Innovations at UR-CAVM as well as ILRI. Focus groups and surveys were carried out with farmers. Informed consent for study participation and photography was obtained from all the study participants in accordance with the ILRI Research Ethics Committee guidelines that also indicate how privacy will be maintained and how data will be handled. Enumerators received training prior to data collection and gender balance was ensured. Farmers who participated in the surveys were compensated in-kind for their time as indicated in the IRB applications.

Coaching, support, and monitoring provided by the Management Entity
In FY 2023 one additional EMMP was submitted to USAID (led by PI Silvia Nyawira). Remaining EMMPs will be submitted to USAID in FY 2024 once outstanding subaward agreements are completed.

The LSIL Monitoring & Evaluation Specialist created project specific EMMP observational forms to facilitate environmental monitoring and activity monitoring field visits by the LSIL ME. These forms outline all the project activities, the monitoring and mitigation expected, and include activity-specific questions to aid the observer and facilitate detailed notetaking.

The Piestar reporting platform was used this year to collect EMMP quarterly monitoring activities. This module allows PIs to indicate their upcoming EMMP monitoring activities and this information facilitates planning of supervisory visits by country coordinators.

X. Open Data Management Plan

In FY 2023, no data assets were submitted for review to the Data Development Library (DDL). Open Data Management plans were created and submitted to USAID for four projects (PI Ouma, PI Dione, PI Umutoni, PI Wu). In FY 2023 the open data management module in Piestar was used to collect information from PIs for all planned datasets to be produced by their projects.

XI. Governance and Management Entity Activity

During FY 2023, the Management Entity continued to provide thought leadership, management, and coordination functions for the Livestock Systems Innovation Lab.

The Livestock Systems Innovation Lab also continued to execute core functions, including providing support to subawardees, conducting communications and outreach, continuing monitoring and evaluation activities, and submitting applications for additional funds as detailed below.

- Administration and finance: Support was provided to subawardees before contracting to finalize their technical narratives and budgets. Also, continued support was given during the implementation of research projects, including reviewing protocols, performance reports and invoices, and reviewing budgets and subaward agreements.
- Compliance: Support was provided to subawardees on compliance, including providing and assisting with adhering to guidelines on restricted commodities, procurement, participant support, export controls, and environmental and research compliance.
- Human Resources: In FY 2023 there were some staffing changes at the Management Entity. The most important one was the change in leadership with Dr. Geoffrey Dahl replacing Dr. Adegbola Adesogan as Director as of February 7, 2023. Dr. Adesogan stays on as Director, Strategic Partnerships. Saskia Hendrickx was promoted from Deputy to Associate Award.
- Mr. K. Lizwelicha, the Finance and Administration Manager, left in November and was replaced by Ms. Alicia Martinez who joined on April 21, 2023. In the interim, Mrs. Jan Machnik took over the financial duties. The Communications Specialist, Mr. Jim Harper, left in April 2023, and despite an extensive search the position is still vacant.
- Communications: The project website (http://livestocklab.ifas.ufl.edu) is updated regularly. It provides access to more than 90 videos of mostly research presentations; 89 of these are also available through the Lab's YouTube channel. The Resources tab links to pages outlining information on journal articles, countries, infographics, innovations, newsletters, podcasts, themes, and videos. In Q4 the success stories shared through the previous Annual Reports were published as blog posts to make them accessible beyond the Development Experience Clearinghouse, DEC, where the annual reports

are posted once approved. Social media grew to include <u>LinkedIn</u> with 580 followers; on <u>Facebook</u> with more than 1,200 followers and <u>X</u> (formerly Twitter) with more than 1,700 followers. Two issues of the "Lively" newsletter were sent out in FY 2023; they are archived on the <u>news</u> section of website. Many new webpages were created, and these include LSIL Academy, ongoing and completed projects.

- Monitoring and Environmental Mitigation and Monitoring: Active support and coaching was provided to subawardees, (see above section IX).
- Applications for additional funding: The LSIL ME worked on several proposals throughout FY2023. One of them to the Bill & Melinda Gates Foundation was awarded on August 29, 2023.

The LSIL ME also met with various international NGOs to discuss collaboration on USAID/Mission funded activities; however, none of them resulted in further collaboration.

Finally, the ME continued to coordinate the functioning of the wider network of LSIL, including the External Advisory Board (EAB), Internal Advisory Committee (IAC), and University of Florida faculty. Written updates were shared per usual procedure. While three EAB meetings had been scheduled, two took place as planned (in December 2022 and May 2023, virtual). The October 2022 meeting was cancelled, and a written update was shared instead. Dr. Jacobs took over as EAB Chair from Dr. Turk in May 2023. Dr. Larbi stepped down as EAB member and has not been replaced. The IAC met once in FY 2023, in mid-June. Dr. Sandra Russo retired and the Dean of the UF international Center, Dr. Marta Wayne took over. Also, as Dr. Dahl became LSIL Director, Ms. Terry Moore, the Director of IFAS Research Administration took over on the IAC.

Faculty meetings: Faculty meetings were generally held bi-weekly throughout the academic year and monthly during the summer semester. During the academic year, the Management Entity often featured an invited speaker. Some meetings were cancelled when most of the faculty were not available or when the LSIL ME was otherwise engaged such as working on proposals in Q4.

XII. Other Topics
No other topics to report.

XIII. Issues
Budget
On August 29, 2023, USAID provided incremental funding in the amount of $4,000,000 thereby increasing the total obligated amount from $26,624,707.00 to $30,624,707.00. The LSIL has effectively earmarked the latest obligation increase for Phase II activities. The additional amount is sufficient to cover project operating costs and LSIL non-competitive funding research activities until June 2024.

Delays in issuing subawards
UF developed Standard Operating Procedures (SOP) for fixed price agreements in Q4 FY2023. The purpose of this mechanism is to ease the financial reporting burden on subaward organizations as well as allow them to receive a payment at the start of the activities. The development of these SOP's took longer than expected as different teams at UF had to approve them as the normal practice for cost reimbursable agreements. This development delayed the issuance of the 7 LCD projects and the 3 remaining short-term projects. As of September 30, 2023, 10 projects, 5 long term, 4 short term, and the challenge project in Rwanda have started activities.

XIV. Future Directions
The Feed the Future Innovation Lab for Livestock Systems main activities for FY 2024 include the following:
- Continuing collaborations with PIs and in-country partners to ensure take up of innovations resulting from the Livestock Systems Innovation Lab's research projects.
- Launching the Challenge Project activities in Rwanda.
- Issuing the LCD subaward projects for in-country organizations.
- Issuing the Scaling RFA and implement the related project selection process.
- Hosting the 2024 Annual General Meeting and Global Nutrition Symposium.
- Publishing research findings in peer reviewed journals as well as other types of publications such as policy and research briefs and innovation summaries.
- Finalizing the EQUIP research subprojects funded by the Bill & Melinda Gates Foundation.
- Pursuing associate award and buy-in opportunities from various sources.

Appendices

a) List of Awards to Partners

Project Name	Lead Institution	Grant Type	Country	Project Start Date	Project End Date	Project Budget
U.S. Institutions						
Integrated Approach to Enhance Milk Quality, Dairy Animal Productivity and Milk Consumption by Vulnerable Household Members in Rural Nepal	Heifer Project International (PI: Shrestha)	Reach	Nepal	1-Sep-23	30-Sep-25	$683,228
Aflatoxin M1 health risks vs. benefits of dairy consumption in Ethiopian children: An epidemiological trial and risk-benefit analysis	Michigan State University (PI: Wu)	Reach	Rwanda	6-Jun-22	5-Jun-25	$750,000
Application of the integrated decision support systems to improve livestock systems and household nutrition in Rwanda: Research and capacity development	Texas A&M University (PI: Srinivasan)	Focus	Rwanda	10-Apr-22	28-Feb-24	$124,623
Deux Oeufs: Cracking the potential of eggs to improve child growth and development	World Vision (PI: Kirby)	Challenge Sub	Rwanda	10-Jul-23	30-Sep-25	$1,055,000
Non-U.S. Institutions						
Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach	International Livestock Research Institute (PI: Dione)	Reach	Burkina Faso	1-Apr-22	31-Mar-25	$632,533
Improving smallholder poultry production and egg consumption in children under two in Ethiopia	University of Liverpool (PI: Stringer)	Focus	Ethiopia	1-Feb-23	31-Jul-24	$124,993
Digital Mentoring and Continuing Education for Improved Service and Market Linkages among Community Animal Health Workers in Nepal	Heifer Project Nepal (PI: Shrestha)	AOI3 sub	Nepal	15-Mar-23	14-Mar-25	$119,469
Enhancing the productivity and resilience of agro-pastoral systems, and income, food and nutrition security through market-oriented innovations in Niger	International Crops Research Institute for the Semi-Arid Tropics (PI: Umutoni)	Reach	Niger	29-Sep-22	28-Sep-25	$749,878
Profiting from pigs in Rwanda: Improving people's lives and livelihoods through more productive pig farming	International Livestock Research Institute (PI: Ouma)	Reach	Rwanda	15-Apr-22	14-Apr-25	$749,402
Developing climate-smart management strategies to improve sustainability of smallholder dairy cattle production systems in Rwanda	Alliance Bioversity/CIAT (PI: Nyawira)	Focus	Rwanda	1-Aug-23	15-Nov-24	$89,689

Success Story 1: Overcoming Chicken Challenges through Effective Coordination

Figure 1 Local rooster in peri-urban Ouagadougou, Burkina Faso (Photo credit: M.Dione)

The Burkinabe poultry sector can become safer and more productive by improved farm and market practices. This is not easy and does not happen overnight. However, this challenge does not stop a dedicated team of researchers under the leadership of Dr. Michel Dione from the International Livestock Research Institute (ILRI) from taking on this challenge. In collaboration with many partner organizations including government officials at various levels as well as the National Poultry Promotion Center (CPAVI), producer organizations and researchers, the team implements the Poultry Losses and One Health (POLOH) project in Burkina Faso to address this challenge.

In FY 2023, 211 stakeholders (including 64 female) were engaged through project workshop launches at central and local levels, site scoping, intervention design, data collection and intervention validation workshops. This co-creation process allowed for the project team to adapt the planned project activities to be more locally driven, ensuring more buy-in from all involved. These interactive sessions built on findings from qualitative research that targeted 240 poultry producers (160 female and 80 male) as well as findings from a quantitative baseline survey targeting 350 chicken-producing households in 23 villages. Indicators targeted during the baseline survey were economic indicators, production indices, chicken consumption practices (meat and eggs), hygiene practices, self-reported health and family health.

These many and very interactive and lively engagements allowed the team to ground truth some of their assumptions. Solutions "known" by experts were not common knowledge among other stakeholders, particularly women that constitute an important part of the poultry sector in Burkina Faso. Through these stakeholder engagements and capacity building activities, the project has raised awareness among stakeholders and technical partners on the importance of considering the One Health approach in dealing with issues along the poultry value chain.

Ten One Health Poultry Champions selected from various institutions are engaged with the project team and partners to co-create innovative Integrated Educational and Training packages using a holistic approach that promotes hygiene practices, biosecurity, improved management, poultry health and welfare, and production of high-quality poultry products. Rather than developing something entirely new, the project worked with CPAVI to improve and complement their existing training manuals (with topics related to One Health) which are already widely used throughout the country. The roll out of the training courses and the related vaccination of poultry will take place in the next fiscal year.

Apart from linkages at the national level, the project team also benefitted from other ongoing research ILRI-led initiatives in Burkina Faso such as *Urban food markets in Africa: Incentivizing food safety using a pull-push approach* project focusing on consumers of chicken meat. The project has further built a partnership with the Medical Research Council (MRC) unit based in The Gambia and part of the London School of Hygiene and Tropical Medicine (LSHTM), which allowed a graduate student to attend a training course on genomics and bioinformatics in April 2023 at the MRC in The Gambia.

Throughout its implementation, the project will strengthen links with partners and stakeholders, which is key for sustainability. It will further encourage the One Health culture among partners, by building on learnings from the interventions' field evaluations.

Figure 2 Stakeholders discussing poultry vaccination strategies (Photo credit: M.Dione)

Success Story 2: Improved Management and Feeding Increase Access to Dairy Products in Rwanda

Figure 1 Milk collection Center in Rwanda (Photo credit: F. Riaño)

Milk remains one of the most important sources of nutrient-dense animal source food in Rwanda, and many other Feed the Future countries. Indeed, the government of Rwanda's Girinka program recognizes the critical importance of milk in the diet of vulnerable populations by encouraging the distribution of cattle to low-income families. However, limitations of feed availability and management training hamper productivity. Mastitis, or udder infection, is a challenge in many settings, as it reduces yield and adversely affects milk quality.

Between 2015 and 2020 (Phase I), Feed the Future Innovation Lab for Livestock Systems affiliated researchers at the University of Florida (UF) partnered with the Swedish Agricultural University and the University of Rwanda (UR) to support the training of Jean Baptiste Ndahetuye as he completed his PhD studying solutions to subclinical mastitis in the Rwanda dairy context. Driven by the efforts of the Innovation Lab's Management Entity this information was used to develop a Rwanda Dairy Farm Assessment and Advisory Tool (RDFAAT) to evaluate and train farmers on methods to improve cow health and productivity, while simultaneously giving tips for better outcomes.

In 2018, in collaboration with the University of Rwanda, the Rwanda Agriculture and Animal Resources Development Board (RAB), and dairy cooperatives, UR and UF researchers trained extension officers and cooperative personnel on the tool and disseminated the tool for field application. In parallel, on the demand side, a project led by Dr. Emily Ouma of the International Livestock Research Institute (ILRI) focused on educating consumers on the nutritional advantages of milk consumption, especially for children under two years of age. It also encouraged producers to hold some milk back from the market for home consumption to improve the nutrition of farm families. That project team also worked with dairy cooperatives to strengthen their capacity and be more commercially oriented while safeguarding milk quality and improving incomes.

In Phase II (2020-2025), these efforts on dairy industry capacity building were leveraged and expanded. A ration balancing tool was linked to the RDFAAT to strengthen knowledge of cow nutrition to support greater productivity. We also evaluated the RDFAAT user satisfaction through direct surveys of those previously trained on the tool, which revealed a positive attitude toward DFAAT and the ration balancing tool but limited penetration into extension programming because access to computer hardware was limited, and the tool was spreadsheet-based. Working with another USAID initiative, the LASER PULSE project under Dr. Kizito Nishimwe at UR, we improved the tools and developed an app for smartphone usage called Zirakamwa, which is available for download from Google Play Store in English or Kinyarwanda thereby significantly increasing access to the tools.

Despite these efforts, milk shortages in the dry season still need to be solved. In FY 2023, a joint RAB and UF research team concluded that feed preservation and stockpiling knowledge, as well as water conservation methods, were limited and hampered milk output in the dry season. The main recommendation was to aggressively increase training using a training of trainers' approach to sharing the knowledge on best practices with a large number of dairy-producing households. Additional training curricula were developed, and training was expanded to additional UR, the Rwanda Dairy Development project staff, and dairy cooperative extension personnel. The Zirakamwa app is an important tool in this effort as it produces real-time advice tailored to a particular farm and can also be used to track progress in milk output in general, but especially in the dry season.

Figure 2 Rwanda dairy farm (Photo credit: F. Riaño)

To address a complicated and multifactorial challenge such as low milk production, a longstanding collaborative effort on dairy development through various initiatives in Rwanda is needed. Only in this way can we increase the productivity of the dairy sector and improve access to milk among vulnerable populations.

Success Story 3: Bouncing Back Strong: How Resilience Drives Research Success

Feed the Future Innovation Lab research activities are effective, locally adaptable research triggered by real development challenges faced by the Feed the Future countries.

The current research portfolio of the Innovation Lab for Livestock Systems at the University of Florida addresses a wide range of challenges, such as reducing disease morbidity and mortality in poultry in Burkina Faso to assessing the possible negative impact on child growth of contaminated milk with aflatoxin M1 in Ethiopia. All projects aim to sustainably improve livestock productivity and marketing and consumption of animal-source foods (such as milk, meat, and eggs) in order to improve the nutrition, health, incomes, and livelihoods of vulnerable people.

With this approach, international teams composed of researchers from a Feed the Future country and international researchers (usually from the US) contribute to increasing food and nutritional security as well as resilience. According to its 2022 Resilience Policy Revision, USAID defines resilience as "the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth." While many will immediately think of resilience of the project participants and stakeholders, research teams also need to be resilient. Conducting interdisciplinary international research is never easy, especially less when the country is experiencing a deteriorating security situation and even conflict, as was the case in Burkina Faso, Ethiopia, and Niger, some of the countries where the Innovation Lab for Livestock Systems works.

In Burkina Faso, which experienced a coup in September 2022 and has experienced terrorist activities in the northern part of the country, research is still ongoing. While the curfew has restricted the team's movements in the area, the impact has been limited thanks to the strong local support including a veterinary officer as the project focal point appointed by the regional director of agriculture and livestock. In close consultation with local authorities, the researchers were able to collect data from 350 farming households across 23 villages as part of the baseline survey in 2023.

In Niger, the growing insecurity in the Tillabéri region and the July 2023 coup d'état restricted project team movements. To address this challenge, facilitators of the four newly established agro-pastoralist field schools were equipped with smartphones and created a WhatsApp group to support their activities remotely. This mechanism allows for the smooth implementation of the project activities despite movement challenges and ensures that activities stay on track.

These examples show how research teams adapt to changing realities to ensure the necessary research activities happen while ensuring the safety of their teams. The leadership of the Innovation Lab for Livestock Systems is grateful for all the work and commitment of the project teams to help increase the food and nutritional security of vulnerable populations worldwide.

Figure 1 Field visit to smallholder farmers in Torodi, Niger. (Photo credit: I. Abdoussalam)

Improving nutrition in children under two through increased egg consumption in Burkina Faso / Enhancing egg consumption through women's empowerment in Burkina Faso (Phase I)
Sarah McKune | University of Florida

Moore, E.V., Singh, N., Serra. R., and McKune, S.L. 2022. Household decision-making, women's empowerment, and increasing egg consumption in children under five in rural Burkina Faso: Observations from a cluster randomized controlled trial. Front. Sustain. Food Syst. 6:1034618. https://doi.org/10.3389/fsufs.2022.1034618

Moore, E.V., Wood, E., Stark, H., Wereme N'Diaye, A., and McKune, S.L. 2023. Sustainability and scalability of egg consumption in Burkina Faso for infant and young child feeding. Front. Nutr. 9:1096256. https://doi.org/10.3389/fnut.2022.1096256

Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach in Burkina Faso
Michelle Dione | International Livestock Research Institute

Poster: Dione, M., Ilboudo, G., Alders, R., Kagambèga, A., Ima, S., Ganser, C., Boz, Z. and Knight-Jones, T.J.D. 2023. Poster. Key constraints to smallholder village chicken production and marketing systems in Centre-Nord region, Burkina Faso. 2nd Pan-African Poultry Conference, Lomé, Togo, 16–18 May 2023. Nairobi, Kenya: ILRI. https://hdl.handle.net/10568/130459

Lectures, presentations, seminars, webinars:

- Alders, R. June 21, 2023. Seminar. Lessons learnt during the control of avian influenza in family poultry in Africa. IAEA Seminar, Avian Influenza in Africa. Global Health Programme, Chatham House, London, UK and. Development Policy Centre, Australian National University, Canberra Australia.
- Alders, R. August 9, 2023. Seminar. One Health and poultry Health. Ouagadougou, Burkina Faso: University Joseph Ki-Zerbo.
- Alders, R. August 11, 2023. Seminar. One Health et élevage volaille. Ouagadougou, Burkina Faso: University Joseph Ki-Zerbo.
- Alders, R. August 11, 2023. Seminar. Communication: a diverse and complex activity. Ouagadougou, Burkina Faso: University Joseph Ki-Zerbo.
- Alders, R. August 11, 2023. Seminar. Quantitative and qualitative research design: An introduction. University Joseph Ki-Zerbo, Ouagadougou, Burkina Faso.

Reports:

- Lallogo, V.R., Ilboudo, G. and Dione, M. 2022. Inception workshop report. Poultry losses and One Health: Reducing losses and zoonotic risks along the poultry value chain through a One Health approach. ILRI, Nairobi, Kenya. https://hdl.handle.net/10568/125120
- Dione, M., Ilboudo, G., Kagambèga, A. and Ima-Ouoba, S. 2023. Report. Scoping visit in Kaya, Burkina Faso, for the Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach. Nairobi, Kenya: ILRI. https://hdl.handle.net/10568/126825
- Ilboudo, G., Lallogo, V.R and Dione, M. 2023. Report. Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach: Site multi-stakeholder workshop, Kaya, Burkina Faso. Nairobi, Kenya: ILRI. https://hdl.handle.net/10568/129253
- Ima/Ouoba, S.A., Ilboudo, G., Kagambèga, A., and Dione, M. 2023. Report (French language). Etude sur les pratiques de consommation des aliments d'origine animale (poulet et oeufs) des femmes, des enfants et des hommes dans dix villages de la commune de Boussouma au Burkina Faso. Nairobi, Kenya: ILRI.
- Ima/Ouoba, S.A., Ilboudo, G., Kagambèga, A., and Dione, M. 2023. Report (French language). Analyse genre et élevage de poulets traditionnels dans dix villages de la commune de Boussouma au Burkina Faso. Nairobi, Kenya: ILRI.
- Lallogo, V.R., Ilboudo, G. and Dione, M. 2023. Report. Poultry Losses and One Health (POLOH): Reducing losses and zoonotic risks along the poultry value chain through a One Health approach—Transferring qualitative research skills to local stakeholders in the context of poultry health and One Health. Nairobi, Kenya: ILRI. https://cgspace.cgiar.org/handle/10568/129862

Enabling sustainable value chains of crop-livestock systems in Burkina Faso and Niger (Phase I)
Vincent Bado | International Crops Research Institute for the Semi-Arid Tropics

Kabore, M., Sanon, H.O., Kiema, A., Nianogo, A.J. and Gnanda, I.B. 2022. Evaluation des performances de l'embouche ovine paysanne dans la commune de Korsimoro au Burkina Faso (Evaluation of the performance of peasant sheep fattening in the commune of Korsimoro in Burkina Faso). Int. J. Biol. Chem. Sci. 16(3): 1031-1043. https://dx.doi.org/10.4314/ijbcs.v16i3.11 *(not reported previously)*

Safe Food, Fair Food for Cambodia (Phase I)
Delia Grace | International Livestock Research Institute (ILRI)

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Linking cattle nutrition to human nutrition: A value chain approach to improving the production, handling, and consumption of animal source foods in Ethiopia (Phase I)
Jessie Vipham | Kansas State University

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Improving the evidence and policies for better performing livestock systems in Ethiopia (Phase I)
Bart Minten | International Food Policy Research Institute

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Application of integrated decision support systems to improve livestock systems in Ethiopia (Phase I)
Raghavan Srinivasan | Texas A&M University

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Felicia Wu| Michigan State University

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Designing and evaluating innovations for development of smallholder female livestock cooperatives in Nepal (Phase I)
Conner Mullally | University of Florida

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Strategies to increase milk consumption among rural children in Nepal (Phase I)
Bhola Shrestha | Heifer International Nepal

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Enhancing the Productivity and Resilience of Agro-Pastoral Systems, and Income, Food and Nutrition Security Through Market-Oriented Innovations in Niger
Clarisse Umutoni | International Crops Research Institute for the Semi-Arid Tropics

Umutoni, C. and Diama, A. June 2023. Blog. Driving Innovation through Active Farmer Participation. ICRISAT, Niger.

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Dirk E. Maier | Iowa State University

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Enhancing milk quality and consumption for improved income and nutrition in Rwanda (Phase I)
Emily Ouma | International Livestock Research Institute

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Engaging men in supporting maternal and child consumption of milk and other animal source foods in Rwanda (Phase I)
Emily Ouma | International Livestock Research Institute

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Ronald Gordon | University of Florida

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Profiting From Pigs in Rwanda: Improving People's Lives and Livelihoods Through More Productive Pig Farming
Emily Ouma | International Livestock Research Institute

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Application of the Integrated Decision Support Systems to Improve Livestock Systems and Household Nutrition in Rwanda: Research and Capacity Development
Raghavan Srinivasan | Texas A&M University

Bizimana, J.C., July 27, 2023. Seminar. Application of the Integrated Decision Support System (IDSS). Kigali, Rwanda: University of Rwanda

The Human Health Risk of Aflatoxin M1 in Dairy Products (Phase I)
Felicia Wu | Michigan State University

Lorditch, E. June 29, 2022. Blog/Press release. Reducing the amount of spilled milk caused by a toxin. Michigan State University. https://msutoday.msu.edu/news/2022/reducing-spilled-milk-caused-by-aflatoxin

Lectures, presentations, seminars, webinars:

- Wu, F. December 2022. Conference presentation. A tale of two aflatoxins: Cancer risk in maize and peanuts vs. in milk & dairy. Society for Risk Analysis Annual Meeting. December 4-7, 2022. Tampa, FL, USA.
- Wu, F. May 10, 2023. Seminar. How Food Safety Regulations Affect Global Trade, Economics, & Health: Case Studies in Aflatoxin. LSIL Innovation Platform Meeting, Addis Ababa, Ethiopia.
- Wu, F., May 11, 2023. Seminar. A Tale of Two Aflatoxins: How Aflatoxins B1 and M1 Regulations Affect Global Trade, Economics, and Health. Addis Ababa, Ethiopia: Ethiopian Public Health Institute.

Non-competitive Activities
By the Areas of Inquiry and Cross-Cutting Themes | University of Florida

AOI **Livestock Production** and Disease Management

Lectures, presentations, seminars, webinars:

- Dahl, G.E and Kiker, G. July 2023. Conference presentation. Identifying opportunities for circularity in dairy and livestock systems. Circular Bioeconomy Symposium. Annual meeting of the American Society of Agricultural and Biological Engineers. July 9-12, 2023, in Omaha, NE, USA.
- Adesogan, A.T. and Mulubrhan, G. June 2023. Conference presentation. Perspectives on global dairy production. Invited keynote presentation given at the opening session of the Joint meeting of the American Dairy Science Association and the Canadian Society of Animal Science. June 25-28, 2023, in Ottawa, Canada.
- Adesogan, A.T., Mulubrhan, G. and S. Hendrickx. 2023. Seminar. Nutrition-focused research and capacity building for improving livelihoods, nutrition, and the environment. Center for African Studies. Gainesville, FL, USA: University of Florida.

Reports:

- Jiménez, F. Y. R. 2023. Report. Rwanda Dairy Farm Assessment and Advisory Tool: A Qualitative Evaluation Study of Trainees' Experiences and Future Use. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.
- Ngamije, F. M. Mupenzi, A. Adesogan and G. Dahl. 2023. Report. Assessment of the Reasons for Low Dry Season Milk Production in Rwanda. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.

AOI Livestock Production and **Disease Management**

- Journal article: Kiiza, D., Denagamage, T., Serra, R., Maunsell, F., Kiker, G., Benavides, B. and Hernandez, J.A., 2023. A systematic review of economic assessments for brucellosis control interventions in livestock populations. Preventive Veterinary Medicine, p.105878. https://doi.org/10.1016/j.prevetmed.2023.105878
- Poster: Kiiza, D., Kiker, G., Serra, R., Denagamage, Maunsell, F., Benavides, B., Hernandez, J.A. April 2023. Poster. Cost-benefit analysis of an enhanced vaccination program to control brucellosis in zero-grazing cattle in Rwanda. Poster # 33. College of Veterinary Medicine Research & Phi-Zeta Celebration. April 13-14, 2023, in Gainesville, FL, USA. https://research.vetmed.ufl.edu/studies/graduate-student-events/phi-zeta

AOI Human Health, Food Safety & Diets, and Nutrition

Journal articles:

- McKune, S.L., Mechlowitz, K., and Miller, L.C. 2022. Dietary animal source food across the lifespan in LMIC. Global Food Security, Volume 35. https://doi.org/10.1016/j.gfs.2022.100656

Lectures, presentations, seminars, webinars:

- Havelaar, A. May 10, 2023. Seminar. Data Management. Innovation Laboratory for Livestock Systems Partner Meeting, Ethiopia. 2023. Addis Ababa, Ethiopia: ILRI
- McKune, S. June 8, 2023. Keynote presentation. La prise de décision des femmes dans les programmes de changement de comportement pour améliorer l'alimentation des enfants (Women's decision making in behavior change programming to improve child nutritional outcomes). Innovation Platform, Innovation Laboratory for Livestock Systems. Niamey, Niger, USA.

AOI Markets and Innovation Translation

- Journal article: Collishaw, A., Janzen, S., Mullally, C. and Camilli, H. 2023. A Review of Livestock Development Interventions' Impacts on Household Welfare in Low- and Middle-Income Countries. Global Food Security 38. https://doi.org/10.1016/j.gfs.2023.100704
- Seminar: Mullally, C. March 3, 2023. Seminar. The Market Analysis for Pastoralists Project. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.

LSIL Academy:

- Bohn, A., Mullally, C., and Serra, R.. June 23, 2023. Webinar. Introduction to innovation and scaling. Session 1 of the Developing an Innovation Perspective series, LSIL Academy. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.
- Serra, R.., Bohn, A., and Mullally, C. June 29, 2023. Webinar. Leading to impact in ways that will matter to people and planet. Session 2 of the Developing an Innovation Perspective series, LSIL Academy. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.
- Mullally, C., Jasada, I., Padmakumar, V., and Bohn, A.. August 3, 2023. Webinar. The Innovation Packages and Scaling Readiness (IPSR) approach explained, with practical example from Nepal. Session 3 of the Developing an Innovation Perspective series, LSIL Academy. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.

CCT Local Capacity Development

- The [Good Laboratory Practices](#) webpage was renovated and all contents (including the manual and ten videos) have been translated into French.
- Blog: Ugalde-Brenes, A. and Ludgate, N. April 2023. Blog. Putting Local Partners at the Wheel of Capacity Strengthening Activities. Agrilinks. https://agrilinks.org/post/putting-local-partners-wheel-capacity-strengthening-activities

CCT Gender and Youth

- Journal article: Farnworth, C.R., Jumba, H., Otieno, P.E., Galie, A., Ouma, E., Flax, V.L., Schreiner, M.-A., Colverson, K.E. 2023. Gender roles and masculinities in leveraging milk for household nutrition: Evidence from two districts in Rwanda. Food Policy, Volume 118. https://doi.org/10.1016/j.foodpol.2023.102486
- LSIL Academy: Colverson, K.E. June 1-22, 2023. Facilitating Learning with Diverse Audiences. Four sessions. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems.
- Blog: Colverson, K.E. and Harper, J. June 7, 2023. Blog. Will men in the kitchen improve nutrition? IFAS blog, Gainesville, FL, USA: University of Florida., Florida. https://blogs.ifas.ufl.edu/lsil/2023/06/07/will-men-in-the-kitchen-improve-nutrition-women-in-rwanda-say-yes

Lectures, presentations, seminars, webinars:

- Colverson, K.E. October 19, 2022. Lecture. Why Integrate Gender into Research? The Importance of Systems Thinking. Ag Ed and Communications Course – Challenge 2050. Gainesville, FL, USA: University of Florida.
- Colverson, K.E. October 10, 2022. Lecture. Why Integrate Gender into Research? The Importance of Systems Thinking. Global Health Graduate Course. Gainesville, FL, USA: University of Florida.
- Colverson, K.E. 2022. Presentation. Integrating Men and Boys into Household Nutrition – Why is it Important? Session on Gender Equality in Rural Advisory Services. GFRAS Annual Meeting, Chile, October 2022.
- Colverson, K.E. November 3, 2022. Lecture. Why Integrate Gender into Research? The Importance of Systems Thinking. Introduction to Food Systems Class. Gainesville, FL, USA: University of Florida.
- Colverson, K.E. January 13, 2023. Seminar. Should I Include Gender in My Research? Practical Tools for Increasing Equity. Food and Animal Medicine Veterinary Group. Gainesville, FL, USA: University of Florida.
- Colverson, K. January 17, 2023. Webinar. Integrating Gender into Livestock Development Projects. USAID Gender Affinity Group
- Colverson, K. E. September 14, 2023. Seminar. Integrating Gender and Youth into Agricultural Research Projects. Seeds4Life class. Gainesville, FL, USA: University of Florida.
- Colverson, K.E. September 15, 2023. Seminar. Why Integrate Gender into Agricultural Projects? Agricultural Education and Communications department course on Challenge 2050. Gainesville, FL, USA: University of Florida.

CCT Enabling Environment

- Serra, R. June 8, 2023. Seminar. Le context institutionnel au Niger (LSIL Phase I). Grand Hotel. Niamey, Niger.

CCT Future Livestock Systems and Resilience

- Video: Kiker, G. May 2023. Video. Grid Based Modeling 101 Using the G Range and SAVANNA Landscape Models. Feed the Future Innovation Lab for Livestock Systems. Gainesville, Florida, USA. https://youtu.be/UwKmJNdIPpA

Lectures, presentations, seminars, webinars:

- Kiker, G. April 20, 2023. Seminar (hybrid). Grid-Based Modeling 101: Using the G-Range & SAVANNA Landscape Models. Gainesville, FL, USA: University of Florida. https://www.youtube.com/watch?v=UwKmJNdIPp

- Kiker, G. May 23, 2023. Webinar. Presentation of G-Range/Climate Change modeling results to the Joint Special Operations University, Department of Defense, within an invited Intellectual Exchange on West Africa Stability with respect the present and future climate. Gainesville, FL, USA: University of Florida.
- Kiker, G. June 2023. Conference presentation. Global Rangeland Modeling Highlights Zones of Challenge and Opportunity for Livestock Production Areas Under Future Climate Change Conditions. AgMIP 9 Workshop: The Future of Food Meeting. June 27-30 , 2023, in Gainesville, FL, USA.

Management Entity Activities
Management Entity | University of Florida

Blogs:
- Management Entity. November 2022. Blog. Engaging Men Supports Nutrition Improvements in Rwanda. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/11/18/engaging-men
- Management Entity. November 2022. Blog. Webinar Triggers Far Reaching Actions in Nepal. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/11/22/webinar-in-nepal
- Management Entity. December 2022. Blog. Putting Milk Consumption Risks into Context. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/02/aflatoxinb1
- Management Entity. December 2022. Blog. Taskforce to Continue a Project's Legacy in Cambodia. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/07/taskforcecambodia
- Management Entity. December 2022. Blog. Zoom-tastic Innovation Platforms Prove Popular and Efficient. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/08/zoomtastic
- Management Entity. December 2022. Blog. A Shout Out for Milk. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/12/shout-out
- Management Entity. December 2022. Blog. Distance Learning Empowers Women in Rural Nepal to Treat Livestock as a Business. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/19/distance-learning-nepal
- Management Entity. December 2022. Blog. Tabaski: A Huge Market Opportunity for Small Ruminants in Niger. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/20/tabaski
- Management Entity. December 2022. Blog. Building Human Capacity for Livestock Disease Surveillance. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/21/building-human-capacity-for-livestock-disease-surveillance
- Management Entity. December 2022. Blog. A Clean Sweep to Improve Meat Safety in Ethiopia. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2022/12/22/meat-safety-in-ethiopia
- Harper, J. January 2023. Blog. Livestock and Gender Research Lacks Climate Crisis Context. Agrilinks. https://agrilinks.org/post/livestock-and-gender-research-lacks-climate-crisis-context
- Management Entity. June 2023. Blog. Will men in the kitchen improve nutrition?. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://blogs.ifas.ufl.edu/lsil/2023/06/07/will-men-in-the-kitchen-improve-nutrition-women-in-rwanda-say-yes
- Hendrickx, S., Bohn, A., and Havelaar, A. June 2023. Blog. Understanding the disease burden of dairy products in Rwanda. Agrilinks. https://agrilinks.org/post/understanding-disease-burden-dairy-products-rwanda

Innovation Summaries:
- Innovation Summary. July 2023. Pigeon Pea Leaf Hay for Dairy Cattle in Ethiopia. https://livestocklab.ifas.ufl.edu/media/livestocklabifasufledu/pdf-/innovations/IS_ETH_Vipham_Pigeon-pea-leaf-hay-for-dairy-cattle-in-Ethiopia.pdf

Lectures, presentations, seminars, webinars:
- Adesogan, A. November 9, 2022. Invited Talk. Brain Foods: Animal-source-Foods for improved cognition, growth and livelihoods. COP 27 in Sharm El Sheikh, Egypt.

- Adesogan, A. January 16, 2023. Invited Talk. Brain Foods: Animal-source-Foods for improved cognition, growth and livelihoods. FoodFluence in New Orleans, Lousiana.
- Adesogan, A. February 22, 2023. Invited Talk. A nutrition-sensitive, food systems approach to tackling livestock productivity problems in developing countries. Hyderabad, India: International Crops Research Institute for the Semi-Arid Tropics.
- Adesogan, A. February 23, 2023. Invited Talk. Superior nutrition from animal-source foods. Augmenting protein based dietary diversity in Rwandan diets in Kigali, Rwanda.
- Adesogan, A. March 16, 2023. Invited Talk. Agricultural diplomacy: The payoff to the US. Board of Trustees Dinner. Gainesville, FL, USA: University of Florida.
- Harper, J. March 29, 2023. Lecture. Innovations in Communications. International Extension course. Gainesville, FL, USA: University of Florida.
- Odera, E., March 29, 2023. Seminar presentation. Monitoring & Evaluation for Complex Programs. Presented to delegation of Kyrgyzstan Ministry of Agriculture. Gainesville, FL, USA: University of Florida.
- Hendrickx, S., March 31, 2023. Seminar presentation. Relevance of spatial temporal information in disease prevention and control - Example of PPR. Gainesville, FL, USA: University of Florida.
- Adesogan, A. March 30, 2023. Invited Talk. Benefits of animal-source foods in developing countries. Animal Science: Delivering for all our needs. British Society of Animal Science in Birmingham, UK.
- Dahl, G., April 4, 2023. Seminar presentation. Animals Source Foods. Importance to Development of People and Economies. International Food Security Symposium on "Ensuring Food Security in the Tropics Through Livestock Genetic Improvement." Champaign, IL, USA: University of Illinois.
- Adesogan, A. April 21, 2023. Seminar. Nutrition-focused research and capacity building for improving livelihoods, nutrition, health and the environment. Baraza, Center for African Studies Meeting. Gainesville, FL, USA: University of Florida.
- Adesogan, A. May 3, 2023. Invited Talk. The importance of beef and other animal source foods for growth and cognitive development.2023 US Roundtable for Sustainable Beef General Assembly in Boise, Idaho.
- Adesogan, A. June 25, 2023. Invited Talk. Perspectives on global dairying. American Dairy Science Association Annual Meeting in Ottawa, Canada.
- Adesogan, A. June 27, 2023. Invited Talk. Role of livestock in nutrition, cognition and sustainability in developing countries. National Agriculture in the Classroom Conference in Orlando, FL, USA.
- Adesogan, A. September 20, 2023. Lecture. Importance of livestock for meeting the UN sustainable development goals. Challenge 2050. Gainesville, FL, USA: University of Florida.
- Hendrickx, S., September 28, 2023. Webinar. Animal source-foods: importance to the development of people and economies. Ames, IA, USA: Iowa State University.

Reports:
- Management Entity. 2022. Report. The Livestock System in Niger – An Overview. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems and Nairobi, Kenya: ILRI. https://hdl.handle.net/10568/130390
- Management Entity. 2022. Report. The Livestock System in Rwanda – An Overview. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems and Nairobi, Kenya: ILRI. https://cgspace.cgiar.org/handle/10568/130389
- Management Entity. Report. 2022. The Livestock System in Nepal – An Overview. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems and Nairobi, Kenya: ILRI. https://hdl.handle.net/10568/130391

Newsletter:
- Management Entity. February 2023 Lively Newsletter, Issue #19: Growth in Leadership. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://mailchi.mp/24457043c917/lively19
- Management Entity. November 2022 Lively Newsletter, Issue #18: New Projects. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://mailchi.mp/c88b885dbd9d/newprojects

Videos:
- Management Entity. November 18, 2022. Video. More milk, meat and eggs to grow and nourish Rwanda's next generation. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://www.youtube.com/watch?v=vatdgAsNy8s

- Management Entity. November 30, 2022. Video. National Goat Research Program in Increasing the Productivity of Goat Farmers. Gainesville, FL, USA: Feed the Future Innovation Lab for Livestock Systems. https://youtu.be/AO_VF6qhNfo
- Management Entity. March 23, 2023. Presentation and recording. Communications Guidance. Feed the Future Innovation Lab for Livestock Systems. Gainesville, Florida, USA. https://livestocklab.ifas.ufl.edu/projects/onboarding, https://www.youtube.com/watch?v=IkTgDI0RoeI

LSIL in the Media:

- Flavienne, V. September 26, 2022. The issue of extension at the heart of exchanges between livestock stakeholders (Original title: La question de la vulgarisation au cœur des échanges entre les acteurs de l'élevage). The Environmental and Agricultural Research Blog, Le Miroir de l'Infos. Bobo Dioulasso: Burkina Faso. https://lemiroirdelinfo.com/la-question-de-la-vulgarisation-debattue-entre-les-acteurs-de-lelevage *(not reported previously)*
- Nanema, H. September 26, 2022. Food security in Burkina: Towards taking producers' concerns into account in research activities (Original title: Sécurité alimentaire au Burkina : Vers la prise en compte des préoccupations des producteurs dans les activités de recherche) in LeFaso.net, Ouagadougou: Burkina Faso. https://lefaso.net/spip.php?article116270 *(not reported previously)*
- Bafana, B. October 7, 2022. Addressing the Cow in the Room, Lowing for Nutrition and Livelihoods. Inter Press Service. https://www.ipsnews.net/2022/10/addressing-the-cow-in-the-room-lowing-for-nutrition-and-livelihoods
- Victor, M. October 22, 2022. The cow in the room: The roles milk, meat and eggs play in sustainable food systems transformation. ILRI News. Nairobi, Kenya: ILRI. https://www.ilri.org/news/cow-room-roles-milk-meat-and-eggs-play-sustainable-food-systems-transformation

EQUIP/Feed

University of Florida, in partnership with International Livestock Research Institute, *Institute de l'Environnement et de Recherche Agricole*-Burkina Faso, University of California-Davis, ACDI/VOCA, Ethiopian Institute of Agricultural Research, and Hawassa University, Ethiopia

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Management Entity websites created or updated in FY 2023:

LSIL resources online

- The overview of LSIL projects was separated into two pages, and each has the links to the individual projects
  Ongoing: https://livestocklab.ifas.ufl.edu/projects
  Completed: https://livestocklab.ifas.ufl.edu/projects/completed-projects
- A new webpage was set up to showcase all existing offerings of the LSIL Academy.
  https://livestocklab.ifas.ufl.edu/resources/LSIL-Academy

Target countries

Webpages are available for the target countries (click for "overview") and are intended as one-stop resources for country specific knowledge sharing. Each of them provides lists and links to Selected Publications & Research Findings, Useful Resources, Projects, and Partners. The countries represented are:

- Burkina Faso
- Ethiopia
- Nepal
- Niger
- Rwanda