FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

FY21 Annual Report

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USAID

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Tufts UNIVERSITY | GERALD J. AND DOROTHY R. Friedman School of Nutrition Science and Policy

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U.S. Government Partners

Feed the Future Innovation Lab for Nutrition's Global and Local Partners

CONTENTS

I. Feed the Future Innovation Lab for Nutrition

The Feed the Future Innovation Lab for Nutrition (hereafter referred to as the Nutrition Innovation Lab) conducts research to address the following questions: i) how agriculture can be leveraged to achieve improved nutrition; ii) how can multiple sectors of policy and program activity be integrated to improve maternal and child nutrition; and iii) what is the role of neglected biological mechanisms (e.g., aflatoxins, environmental enteric dysfunction) in nutrition. The Management Entity (ME) for the Nutrition Innovation Lab is at Tufts University's Friedman School Nutrition Science and Policy.

II. Research Progress Summary

Objective 1: Understanding Agriculture to Nutrition Pathways

Empirical Evidence on Agriculture and Nutrition

PoSHAN Community Studies in Nepal: Understanding Agriculture to Nutrition Pathways

i) Description:

The Policy and Science for Health Agriculture and Nutrition (PoSHAN) Community Studies is a large dataset of over 40,000 person-visits conducted during four annual, nationally representative surveys (2013-2016). Four seasonal surveys in district sites were designed, led, and overseen by the Johns Hopkins University (JHU) team through collaborative NGOs in Nepal (New ERA and NTAG) across the mountains, hills and plains of the country.

ii) Locations:

21 districts in Nepal; Taplejung, Terhathum, Morang, Solukhumbhu, Saptari, Ramechhap, Dhanusha, Sarlahi, Bara, Sindhupalchowk, Rasuwa, Kathmandu, Lamjung, Nawalparasi, Arghakhachi, Rolpa, Banke, Jumla, Mugu, Bajhang, and Doti.

iii) Collaborators:

Johns Hopkins University, National Agriculture Research Centre (NARC), Tribhuvan University, New Era, Nepali Technical Assistance Group (NTAG), Institute of Medicine (IOM), Purdue University, and Tufts University.

iv) Accomplishments:

During this period, the JHU/Nutrition Innovation Lab team had papers published, in-press, and papers in submission. The team has been actively working to submit other papers that have been listed in the workplan. Members from the team have also made presentations over the past year related to our work,

including webinars through the Nutrition Innovation Lab. The team is particularly proud that a manuscript by Vintuna Shrestha, a former student from the Nepal Institute of Medicine (IOM), was published in *PLoS One*. The paper was based on her thesis, which our team actively supported over the years.

The Complete datasets of the PoSHAN Community Studies remain available for download at the Johns Hopkins Libraries data archive. Thus far we have had 123 downloads of the 2013-2016 annual datasets (49 since last report) and 48 downloads of the full seasonal 2013-2015 datasets (10 since last report). The data also all resides at the USAID DDL.

v) Presentations and Publications:

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Andrew Thorne-Lyman	NIL Webinar- Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia: The Intersection of Agriculture, Nutrition, and Health	Virtual	Seasonality of the Child Dietary Diversity Indicator in Nepal, Peru, and Senegal	Nov. 4, 2020	321
Elena Broaddus	NIL Webinar- Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia: The Intersection of Agriculture, Nutrition, and Health	Virtual	Young Children's Consumption of Non-Staple Micronutrient-Rich Foods in Nepal: Seasonality and Associations with Small-Scale Livestock Production	Nov. 4, 2020	321
Andrew Thorne-Lyman	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	Why Child Development Within Nutrition Innovation Lab Research	Feb. 3, 2021	556
Swetha Manohar	NIL Webinar: Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Supporting Capacity Building in Nepal	April 7, 2021	215

Andrew Thorne-Lyman	NIL Webinar- The Role of Micronutrients in Child Growth and Development	Virtual	Lifecycle Connections in Our Micronutrient Related Research in Nepal	May 19, 2021	638
Andrew Thorne-Lyman	NIL Legacy Event	Virtual	Insights into the Seasonality of Diets and Food Systems from the PoSHAN Community Studies in Nepal	Sep. 16, 2021	332
Keith West/ Swetha Manohar	NIL Legacy Event	Virtual	Generating Sustainable Human and Institutional Capacity in Nepal.	Sep. 17, 2021	332

Publications:

- Shrestha V, Paudal R, Sunuwar DR, Thorne-Lyman AL, Manohar S, Amatya A. (*2021)* Factors associated with dietary diversity among pregnant women in the western hill region of Nepal: a community based cross-sectional study. *PLoS One*. Link

  This manuscript is based on the master's thesis of IOM student Vintuna Shrestha. Vintuna also participated in a number of USAID Nutrition Innovation Lab capacity building activities including multiple Scientific Symposia in Nepal, and the first national workshop on human nutrition research in Nepal in 2018. In this manuscript, a survey was done of 327 pregnant women in the western hill region of Nepal and factors associated with a diverse diet were examined. Modifiable risk factors associated with women's dietary diversity (MDDW) included greater empowerment, wealth, employment and nutritional knowledge.
- Kruijssen F, Tedesco I, Ward A, Pincus L, Love D, Thorne-Lyman AL. Loss and waste in fish value chains: a review of the evidence from low- and middle-income countries. *Global Food Security*. Link

  This review is perhaps the first systematic examination of how loss and waste has been measured and quantified in fish value chains, including nutritional loss, with particular focus on low- and middle-income countries.
- Love DC, Allison EH, Asche F, Belton B, Cottrell RS, Froehlich HE, Gephart JA, Hicks CC, Little DC, Nussbaumer EM, da Silva PP, Poulain F, Rubio A, Stoll JS, Tlusty MF, Thorne-Lyman AL, Troell M, Zhang W. Emerging Covid-19 impacts, responses and lessons for building resilience in the seafood system. *Global Food Security*. Vol 28, 100494. Link.

  In this manuscript, written in collaboration with many global experts from the seafood sector, we studied how Covid-19 disrupted and impacted the seafood sector in different parts of the world, how governments responded and outline measures that could be used to help build resilience based on past shocks.
- Zaharia S, Ghosh S, Shrestha R, Manohar S, Thorne-Lyman AL, Bashaasha B, Kabunga N, Gurung S, Namirembe G, Appel K, Liang L, Webb P. Sustained intake of animal-sourced foods is associated

with less stunting in young children *Nature Food 2*, 246–254 (2021). https://doi.org/10.1038/s43016-021-00259-z

- Pasqualino, M., Thorne-Lyman AL, Manohar S, KC A, Shrestha B, Adhikari R, Klemm RD, West Jr. KP. The Risk Factors for Child Anemia Are Consistent across 3 National Surveys in Nepal. *Current developments in nutrition*, 5(6), nzab079. https://doi.org/10.1093/cdn/nzab079
  This analysis examines change in maternal anemia prevalence over time in the PoSHAN studies in 2013, 2014 and 2016 and examines risk factors for anemia in each of these years, assessing the stability and change in the magnitude of both prevalence and direction and strength of risk factors in a national study design that controlled for seasonal, geographic and household variability.
- Miller LC, Neupane S, Sparling T, Joshi N, Lohani M, Thorne-Lyman, A. Maternal depression is associated with less dietary diversity but not anthropometry or development among children in rural Nepal. *Maternal & Child Nutrition*, Matern Child Nutr. 2021;e13221. https://doi.org/10.1111/mcn.13221.
  Maternal depression has been associated with adverse child growth and development but less is known about its relationship to children's diet. In this cross-sectional study from Banke, Nepal, we found that the prevalence of maternal depression was quite high (21%) and was associated with lower child dietary diversity but not child anthropometry or child development. Understanding the relationship of depression to child outcomes and the role of other household factors could help to develop interventions to improve child well-being.
- Thorne-Lyman AL, Bevis LM, Kuo H, Manohar S, Shrestha B, KC A, Klemm RD, Heidkamp RA. Season of Data Collection of Child Dietary Diversity Indicators May Affect Conclusions About Longer-Term Trends in Peru, Senegal, and Nepal. *Current Developments in Nutrition.* https://doi.org/10.1093/cdn/nzab095
  This is the first manuscript in the peer review literature to examine the question of how the minimum dietary diversity for children (MDD) indicator recommended by WHO and UNICEF responds to seasonality. We do so in three countries on three continents: Peru, Senegal, and Nepal. In Peru, we found evidence of a small but significant pattern of seasonality, and we observed similar but non-significant patterns in both Senegal and Nepal. We also highlight how the mean food group score could be a more useful indicator than MDD for tracking progress in contexts with very low dietary diversity such as Senegal.
- Liang L, Shrestha R, Ghosh S, Webb P (2020) Using mobile phone data helps estimate community-level food insecurity: Findings from a multi-year panel study in Nepal. PLoS ONE 15(11): e0241791. https://doi.org/10.1371/journal.pone.0241791.
  This paper explores empirical relationships between data relating to mobile phones (ownership and spending on service use), and food insecurity in rural Nepal. The work explores models for estimating community-level food insecurity through aggregated mobile phone variables in a proof-of-concept approach. In addition, sensitivity analyses were performed by considering the performance of the models under

different settings. The results suggest that mobile phone variables on ownership and expenditure can be used to estimate food insecurity with reasonable accuracy. This suggests that such an approach can be used in and beyond Nepal as an option for collecting timely food insecurity information, either alone or in combination with conventional approaches.

Papers Under Review:

- Manohar S, Colantuoni E, Shrestha B, Thorne-Lyman AL, Adhikari RK, KC A, Bhattarai A, West Jr KP Use of a novel velocity reference reveals the extent of linear growth faltering throughout the preschool years in Nepal Under review at *Journal of Nutrition.*
  We put forth a metric (LGVZ: Linear Growth Velocity z-score) with which to identify growth faltering in populations using a novel, annual growth velocity reference concatenated from the extant WHO Child Growth Velocity Standards and Tanner Height Velocity Reference that covers the entire birth to 59-month age range. We illustrate its application in a representative cohort of 4439 preschool children from Nepal's plains, followed between 2013-2016

Manuscripts Developed—Submission Expected January 2022:

- Neupane S et al. Exposure to agricultural extension and other services is associated with improved agricultural practices among households in the PoSHAN study. To be submitted to *World Development.*
  In many countries, including Nepal, agricultural technologies are disseminated through groups and agricultural extension workers. Increasingly such groups are viewed as an opportunity for improving nutrition of farmers. We use national data from the PoSHAN study in Nepal to examine the adoption of many technologies by farmers and explore whether adoption is associated with greater production of food groups that could influence dietary diversity scores (starchy staples, vitamin A rich fruits and vegetables, milk, and eggs), and explore whether this in turn was associated with improvements in maternal and dietary diversity.
- Manohar et al. Risk factors of childhood linear growth faltering in the plains of Nepal. To be submitted to *Journal of Nutrition.*
  In this manuscript we examine age-specific individual, community, and household level risk factors associated with growth faltering using the novel growth velocity reference outlined by Manohar et al (above). We examine these relationships in a representative cohort of 4439 preschool aged children from Nepal's plains from 2013-2016.
- KC A et al. Dual burden of malnutrition among women of reproductive age in Nepal: National risk factors for overweight and thinness. To be submitted to *Journal of Population Health Nutrition*
  Using the 2016 national PoSHAN dataset, this manuscript examines risk factors for under and overweight/obesity using BMI cutoffs in the same models, looking at age as a key predictor of BMI.
- Manohar et al. Age and sex profiles for attained growth patterns in early childhood: evidence from a four-year community-based study in the Tarai of Nepal. To be submitted to *Pediatrics.*

Building further on our investigation of growth patterns in the Tarai, this paper compares data on child growth (attained and growth velocities) vs. WHO growth standards to identify when risk of deceleration is most apparent in these vulnerable populations. This work can be used to help inform the targeting of interventions within the lifecycle.

- Thorne-Lyman AL et al. Household expenditures and consumption on processed and unprocessed foods in Nepal. To be submitted to *Maternal and Child Nutrition*.

  In this analysis we are using data we collected from each of the 2013, 2014 and 2016 national surveys showing the proportion of household monthly food expenditure on processed and "junk" foods purchased in local markets by agro-ecological zone. We are presently assessing stability and change of purchasing patterns and associated patterns of child and maternal consumption of processed food items by wealth and food security indices.
- Thorne-Lyman AL et al. How does the minimum dietary diversity for women (MDDW) index track over time in a longitudinal cohort in Nepal?

  The minimum dietary diversity for women (MDDW) indicator is a key indicator used to measure the impact of nutritional interventions and programs and by countries to track progress of efforts to improve diets at a country level. Yet because it relies on a single 24-hour recall, it is subject to random within person variability. Few efforts have examined how the indicator tracks across seasons or years in the same women or quantified how much error is associated with this one-time measure when it is used to represent "normal" diet, which is the aim of this manuscript.
- Miller M. et al Home food production buffers against a diet of impoverishment in rural Nepal.

  Originally analyzed for 2013, now expanded to all survey years, this paper examines the question of whether homestead food production of certain items is associated with greater consumption of those items, to underscore the importance of stability and change.
- Bhandari S. et al Pre- and post-harvest losses are associated with household food security: findings from a longitudinal observational study in Nepal.

  This analysis explores the association between reported post-harvest losses and food insecurity using longitudinal PoSHAN community study data.
- Thorne-Lyman AL et al. How do diets diversify in Nepal: an exploration of women's and children's dietary patterns.

  We will use latent class analysis to generate and assign dietary patterns to women and for children and examine how factors including socioeconomic status, agroecological zone, caste, and agricultural cropping patterns influence dietary patterns. We will also explore how certain items such as unhealthy foods vary across dietary patterns, as well as interrelationships between women's patterns and children's patterns.
- Kim K et al. Do roads bring junk food? Evidence from Nepal using OpenStreetMap Data

  This manuscript, led by a doctoral student from Ohio State, uses PoSHAN data to examine whether the expansion of roads in Nepal from 2013 to 2016 was associated with growing consumption of processed snack foods.

- Emmett S. Chronic suppurative otitis media in Nepal: National prevalence and risk factors
  This manuscript looks at prevalence and risk factors for chronic otitis media in Nepal using data from 2013-2016.

PoSHAN Policy and Governance within Nutrition and Agriculture

i) Description:

The Policy Process study was conducted as part of the Policy and Science for Health, Agriculture and Nutrition (POSHAN) Community study. The PoSHAN Community study consists of a nationally representative household panel collected annually from 2013 to 2016 in Village Development Communities (VDCs) across the three agro-ecological zones of Nepal (Mountains, Hills and Terai). The PoSHAN Policy study utilized the same study design and timeframe but focused on institutional respondents within VDCs. Thus, the PoSHAN Policy study sampled government and non-government officials while the PoSHAN Community study surveyed households, and women and children within these households. Seven VDCs were sampled from the three agro-ecological regions of Nepal (Mountains, Hills and Terai), resulting in twenty-one VDCs. From each VDC, three wards (roughly equivalent to neighborhoods) were selected at random, resulting in 63 wards. Households eligible for inclusion in the PoSHAN Community study were those with a child younger than five years or had a woman who was married within the past two years. The PoSHAN Policy study targeted relevant offices and organizations within VDCs based on their defined responsibilities in implementing Nepal's Multisector Nutrition Plan (MSNP).

ii) Locations:

21 districts in the three agro-ecological zones of Nepal; Taplejung, Terhathum, Morang, Solukhumbhu, Saptari, Ramechhap, Dhanusha, Sarlahi, Bara, Sindhupalchowk, Rasuwa, Kathmandu, Lamjung, Nawalparasi, Arghakhachi, Rolpa, Banke, Jumla, Mugu, Bajhang, and Doti.

iii) Collaborators:

SNV Laos, Tufts University, USAID Ethiopia

iv) Accomplishments:

During the period, a manuscript titled, "Measuring Governance: Developing a Novel Metric for Assessing Whether Policy Environments are conducive for the Development and Implementation of Nutrition Policies in Nepal," was published in the *International Journal of Health Policy Management* in August 2020. The manuscript has garnered renewed interest from program implementers and researchers across Asia and Africa (Laos, Ethiopia, Tanzania and Iran) who expressed interest to replicate the application and methods of nutrition governance index (NGI) . As a response to this interest, the Tufts ME has been supporting the program implementers at SNV Laos to implement a survey that allows the application of NGI tools (developed by the Nutrition Innovation Lab) to measure quality of nutrition governance in Laos. Similarly,

analytical discussions have been ongoing to replicate the methods of NGI to assess governance in Ethiopia, using datasets from a prior research study conducted in 2013. The ME continued to contribute and provide its technical guidance to the two research projects. Preliminary discussions to adapt NGI study tools in Tanzania have also occurred. In addition, discussions to adapt the NGI study in Burkina Faso have been ongoing. This transfer of knowledge, innovations, and evidence around quantitative measurement of nutrition governance to a wider audience of program implementers, researchers and policymakers is a key accomplishment for the Nutrition Innovation Lab.

Similarly, a paper exploring the relationship between effectiveness of nutrition governance and nutrition outcomes, using datasets from the Nepal PoSHAN community studies and policy process studies, was published in the BMC Pediatrics journal in October 2021. The paper assesses the utility of NGI to predict nutrition outcomes in rural Nepal. We applied the NGI in this context and found that at the subnational level, those with effective governance positively affected improved nutrition outcomes in children. Specifically, NGI was positively associated with outcomes such as head-for-age (HAZ) and weight-for-height (WHZ) z-scores in older children (more than 24 months) compared to younger children (less than 24 months). These results highlight the importance of effective management of policy-based programming and resource use to bring about nutrition gains on the ground. The NGI explained a non-negligible amount of variation in HAZ and WHZ, which underscores the fundamental role that good governance plays in promoting child nutrition and growth, and the value of seeking to measure it to assist governments in moving policies from paper to practice.

v) Presentations and Publications:

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Eileen Kennedy	NIL Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Virtual	Nutrition Policy and Governance in Ethiopia: What Difference Does Five Years Make?	March 3, 2021	308
Grace Namirembe	NIL Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Virtual	Development of a Novel Metric: The Nutrition Governance Index (NGI)	March 3, 2021	308

Shibani Ghosh	NIL Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Virtual	Effective Governance for Nutrition Programs: the POSHAN Policy Process Studies	March 3, 2021	308
Shibani Ghosh	Keynote for USAID's Asia-focused Global Learning Experience Exchange (GLEE)	Virtual	Multi-sectoral Nutrition: Evidence for action	Mar. 24, 2021	550
Patrick Webb	Keynote webinar for USAID's Africa-focused Global Learning Experience Exchange (GLEE)	Virtual	What evidence can we rely on for multisector programming for nutrition?	Mar. 24, 2021	550
Eileen Kennedy	NIL Legacy Event	Virtual	Nutrition Policy and Governance in Ethiopia: What Difference Does 5 Years Make?	Sep. 16, 2021	332
Patrick Webb	NIL Legacy Event	Virtual	Measuring the 'Quality' of Policy Implementation: A Nutrition Governance Index Tested in Nepal	Sep. 16, 2021	332
Rolf Klemm	NIL Legacy Event	Virtual	Key Lessons Learned on the Design and Implementation of Multisectoral Programs for Nutrition in Nepal	Sep. 16, 2021	332

Publications:

- Namirembe G, Shrestha R, Mezzano J, Ausman L, Davis D, Baral K, Ghosh S, Shively G, Webb P. Effective Nutrition Governance is Correlated with Better Nutrition Outcomes in Nepal. *BMC Pediatrics Journal.* https://doi.org/10.1186/s12887-021-02898-4

i) Capacity Building:

The findings from the PoSHAN policy process were shared through a webinar in March 2021. The webinar was attended by 308 participants.

Understanding Connections among Agriculture, Nutrition and Health

Research at Purdue University on Agriculture and Food Security

i) Description:

This project is hypothesis-driven research examining connections between agriculture and human nutrition. A wide range of field experiment and observational data were used to identify pathways by which agriculture is linked to nutritional outcomes.

Specific Aim 1: Understand determinants of child linear growth and weight gain.

Specific Aim 2: Measure patterns of association among individual, household, and community factors in food security, dietary diversity, food safety and nutritional outcomes.

Specific Aim 3: Measure separately the agricultural (food production) and health pathways that lead to improved nutrition outcomes.

ii) Locations:

Bangladesh, Malawi, Nepal, Uganda.

iii) Collaborators:

The PI worked with graduate students, colleagues at Tufts and other universities, CGIAR and World Bank partners, and other NIL project partners to conduct policy-relevant economic research related to agriculture, nutrition, and human health in Feed the Future countries.

iv) Accomplishments:

Activities contributed to providing a better understanding of the complex connections among agriculture, nutrition, and health. Work focused on conducting hypothesis-driven research examining connections between agriculture and human nutrition. A wide range of field experiment and observational data were used to identify pathways by which agriculture is linked to nutritional outcomes. Achievements include: (1) better empirical understanding of determinants of child linear growth and weight gain; (2) measurement of patterns of association among individual, household, and community factors in food security, dietary diversity, food safety and nutritional outcomes; (3) more accurate measurement of the agricultural (food production) and health pathways that lead to improved nutrition outcomes; (4) dataset construction and data analysis; (5) graduate student training; (6) presentation of research findings; (7) publication of research findings in peer-reviewed publications (see list below).

v) Presentations and Publications:

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Gerald Shively	NIL Legacy Event	Virtual	Understanding the Role of Isolation in Nutritional Risk: Past, Present, and Future	Sep. 16, 2021	332

Publications:

- Josephson, Anna and Gerald Shively. 2021. Unanticipated Events, Perceptions, and Household Labor Allocation in Zimbabwe. *World Development*. Vol. 141, 105377. https://doi.org/10.1016/j.worlddev.2020.105377.
- Debela, Bethelhem Legesse, Gerald Shively and Stein Holden. 2021. Implications of Food-for-Work Programs for Diet and Production Diversity in Ethiopia. *Jou. Agricultural and Food Econ.* (in press).
- Shively, Gerald and Alecia Evans. 2021. Dietary Diversity in Nepal: A Latent Class Approach. *Food and Nutrition Bulletin*. https://doi.org/10.1177/0379572121998121.
- Ambikapathi, Ramya, Germana Leyna, Alli Mangana, Dominic Mosha, Crystal Patil, Morgan Boncyk, Savannah Froese, Cristiana Edwards, Patrick Kazonda, Japhet Killewo, Gerald Shively, Mary Mwanyika-Sando, Nilupa S. Gunaratna. 2021. Informal food environment is associated with household vegetable purchase patterns and dietary intake in the DECIDE study: Empirical evidence from food vendor mapping in peri-urban Dar es Salaam, Tanzania. *Global Food Security* 28: 100474. https://doi.org/10.1016/j.gfs.2020.100474.
- Andrews-Trevino, Johanna, Patrick Webb, Gerald Shively, Ahmed Kablan, Kedar Baral, Dale Davis, Krishna Paudel, Robin Shrestha, Ashish Pokharel, Sudikshya Acharya, Jia-Sheng Wang, Kathy S. Xue, Shibani Ghosh. 2021. Aflatoxin exposure and child nutrition: measuring anthropometric and long-bone growth over time in Nepal. *American Journal of Clinical Nutrition* nqaa397, https://doi.org/10.1093/ajcn/nqaa397.
- Shively, Gerald, Tim Smith and Megan Paskey. 2020. Altitude and Child Linear Growth in Nepal. *Mountain Research and Development* 40(3): R11-R20. https://doi.org/10.1659/MRD-JOURNAL-D-19-00063.1.
- Andrews-Trevino, Johanna, Patrick Webb, Gerald Shively, Beatrice Rogers, Kedar Baral, Dale Davis, Krishna Paudel, Ashish Pokharel, Robin Shrestha, Jia-Sheng Wang, Kathy Xue, and Shibani Ghosh. 2020. Dietary determinants of aflatoxin B1-lysine adducts in pregnant women consuming a rice-dominated diet in Nepal. *European Journal of Clinical Nutrition* 74: 732-740. https://doi.org/10.1038/s41430-019-0554-2.
- Omiat, George and Gerald Shively. 2020. Rainfall and Child Weight in Uganda. *Economics and Human Biology* 38. http://dx.doi.org/10.1016/j.ehb.2020.100877.
- Kadjo, Didier, Jacob Ricker-Gilbert, Gerald Shively and Tahirou Abdoulaye. 2020. Food safety and adverse selection in rural maize markets. *Journal of Agricultural Economics* 71(2): 412-438. https://doi.org/10.1111/1477-9552.12350.
- Shively, Gerald and Jacob Schmiess. 2021. Altitude and early child growth in 47 countries. *Population*

and Environment. https://doi.org/10.1007/s11111-021-00390-w.

- Zaharia, S., W.A. Masters, S. Ghosh, G. Shively, S. Gurung, S. Manohar, A. Thorne-Lyman, K. West, K.H Appel., L. Liang, R. Shrestha, B. Bashaasha, N. Kabunga, P. Webb. Recovery without resilience? Measuring transitory shocks to nutrition of women and children from Nepal, Bangladesh and Uganda. *Global Food Security.* https://doi.org/10.1016/j.gfs.2021.100573

Submissions to Peer-Reviewed Journals:

- Mishra, K. and G. Shively. Impact of Remittances on Household Consumption in Nepal. Under review at *World Development*.
- Zaharia, S., W.A. Masters, G. Shively, S. Ghosh, P. Webb. Measuring Resilience as Asymmetric Mean Reversion. Under review at the *Journal of Development Economics*.
- Lopez-Barrera, E. and G. Shively. Excess calorie availability and adult BMI: a cohort analysis of patterns and trends for 156 countries from 1890 to 2015. Under review at *World Development*.

vi) Issues and Concerns:

No significant problems or barriers to progress. Covid-19 considerations slowed efforts in some ways, and the publication process remains slow and frustrated by long review times.

Impact of Specific Behavior Change Communication (BCC) Layered over a Livestock Training Intervention on Nutrition

i) Description:

Community Development and Nutrition Education in Nepal: Effects on child Health and Growth.

Five rounds of data collection were collected between July 2013 and May 2016 (Project 2A). A sixth round was conducted in August 2017. The goal was to investigate child health and nutrition in communities randomized to receive one of three interventions: (1) Heifer community development activities and livestock training, supplemented by specific training in child nutrition; (2) livestock training and nutrition training alone; or (3) no activities. Five rounds of data collection for this project were completed.

This project (Project 2B) was funded by the Nutrition Innovation Lab by a grant to the Harvard School of Public Health (HSPH). Heifer International was invited to collaborate with HSPH, the Institute of Medicine (Nepal), and the University of Bergen (Norway) to conduct a field trial of a child development assessment tool (Ages and Stages Questionnaire, ASQ). Specific aims of this project were to 1) validate the use of this instrument in rural Nepal, and 2) explore the feasibility of training non-professional field staff to administer this test accurately. This was accomplished as an ancillary activity during Round 3 of data collection of Project #2. The details of this collaboration are described in reports submitted by the HSPH.

This project (Project 2C) was a direct extension of Project 2B. The developmental assessment conducted in Project 2B was extended to include testing of children ages 5-6 years. For this activity, funding was provided by the Nutrition Innovation Lab to Heifer International. Data collection for this activity was completed in August of 2017.

These activities generated a large amount of data. Additional funding was provided by the Lab to cover data management, analysis, and writing. The goals and progress of these activities are shown below:

Specific Aim 1: Disaggregate the effect of nutrition and livestock training from social capital development in the longitudinal assessment of child health and growth. Assess the impact of training alone, training in the context of social capital development, vs no inputs (control group) on:

a. household status (income, SES, animal ownership, etc.)
b. child and household diet quality (consumption of animal source foods, dietary diversity)
c. child health
d. child growth

ii) Locations:

Banke district in Nepal.

iii) Collaborators:

The collaborators of project 2B were Heifer International, Harvard School of Public Health (HSPH), the Institute of Medicine (Nepal), and the University of Bergen (Norway). The main external engagement of this project has been via the close collaborations with Dr. Andrew Thorne-Lyman (Johns Hopkins University) and with Mr. Sumanta Neupane (IFPRI). These valued collaborators have been very involved with data analysis and preparing papers for publication. Collaboration with Dr. Merina Shrestha (Institute of Medicine, Kathmandu) has also continued.

iv) Accomplishments:

Work has continued on the previously completed NIL-funded project, "Child health and nutrition after livestock interventions in rural Nepal: disaggregating the effects of social capital development and training inputs." During the reporting period, findings were also presented during a Nutrition Innovation Lab webinar on February 3, 2021.

v) Presentations and Publications:

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Laurie Miller	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	Dietary Quality over Time is Associated with Better Development in Young Rural Nepali Children	Feb. 3, 2021	556
Merina Shrestha	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	Ages and Stages Questionnaire 3rd Edition	Feb. 3, 2021	556
Laurie Miller	NIL Webinar-Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda	Virtual	Multisectoral Community Development in Rural Nepal	May 12, 2021	377
Neena Joshi	NIL Webinar: Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda	Virtual	Multisectoral Community Development in Rural Nepal	May 12, 2021	377
Neena Joshi	NIL Legacy Event	Virtual	Agriculture Nutrition Linkages- Heifer Nepal Experiences	Sep. 16, 2021	332

Publications:

- Miller LC, Neupane S, Joshi N, Shrestha M, Neupane S, Lohani M, Thorne-Lyman A. Dietary quality is associated with better development in rural Nepali children. Maternal Child Nutrition, DOI: 10.1111/mcn.12964, 2020.

- Miller LC, Neupane S, Joshi N, Lohani M, Thorne-Lyman A. Child Diet and Household Characteristics Relate Differently to Child Development at the Beginning and the End of the Second "1000 Days" in Rural Nepal. ***Food and Nutrition Bulletin***, 42(1), 36–54. https://doi.org/10.1177/0379572120987976
- Miller LC, Neupane S, Sparling T, Joshi N, Lohani M, Thorne-Lyman, A. Maternal depression is associated with less dietary diversity but not anthropometry or development among children in rural Nepal. *Maternal & Child Nutrition*, Matern Child Nutr. 2021;e13221. https://doi.org/10.1111/mcn.13221

Manuscript in Progress:

- Nutrition education as part of a multisectoral community development program improves women's hygiene practices and knowledge of infant and young child feeding (IYCF), but not their breast-feeding practices: comparison with women who received nutrition education alone.

Strategies to Increase Milk Consumption Among Young Children in Rural Nepal

i) Description:

The principal funder for this project is the Livestock Systems Innovation Lab; supplemental funding is supplied by the Nutrition Innovation Lab. This supplemental funding allowed two important additions to the project: (1) an increase in the number of enrollees, and (2) the inclusion of developmental testing of the children at baseline and at endline.

This project enrolled ~130 households in each of two arms. All households received prior training in "Good Animal Husbandry Practices" (e.g., mastitis control, hygiene, etc.), and have at least one child <60 months of age. The study was designed such that one arm would receive nutrition training targeting consumption of milk and other ASFs by children; the other would serve as a control group. Household surveys, anthropometry, child diet, and child development were planned at 3 intervals over 12 months. Cessation of field activities 2 months after the baseline survey was conducted has greatly hindered progress.

Specific aim #1: Develop a focused nutrition curriculum targeting milk consumption by young children. STATUS: This was developed. In addition, a refresher curriculum was developed and used in the recent training in anticipation of resuming household surveys. In addition, two MSc Nutrition interns (College of Applied Food and Dairy Technology, Kathmandu [CAFODAT]) have been deployed to the project areas to provide regular visits to the mothers in the Intervention Group to reinforce training on different aspects of human/child nutrition.

Specific aim #2: Evaluate the extent to which households which received prior training in optimizing dairy animal productivity have continued to adhere to GHP. STATUS: With the recent resumption of research activities in the field, two MSc Nutrition interns (the same individuals described above) have been deployed in the project area to collect information regarding adherence to former training on GHP and mastitis control.

Specific aim #3: Assess relationship of household milk production and child milk consumption. STATUS: This has not been done due to Covid restrictions.
Specific aim #4: Relate milk consumption to child outcomes including growth and development. STATUS: This has not been done due to Covid restrictions.

ii) Collaborators:

This project has allowed for engagement between Livestock and Nutrition Innovation Labs. This relationship has been facilitated by the supplemental funding provided by the Nutrition Innovation Lab for this project activity. Sumanta Neupane (IFPRI) and Dr. Merina Shrestha (IOM, Kathmandu) and her colleagues in the Department of Pediatrics have been previously involved with our work funded by the Nutrition Innovation Lab. We now bring their expertise and knowledge to this jointly funded project.

iii) Locations:

Bardiya, Dang (Nepal).

iv) Accomplishments:

During the period between September 2020 and February 2021, field research activities were paused due to the COVID situation. Other activities are listed below:

- Cleaning of MILK PROJECT baseline survey was completed.
- Multiple budgeting and planning sessions with Heifer Nepal/Heifer HQ/ and University of Florida, related to uncertain timeline/NCE status, etc.
- Permission was granted from the NHRC (Nepal Health Research Council) and from Tufts University (multiple levels) to resume field research activities for MILK PROJECT.
- New module developed to address impact of COVID on enrolled research participants. Permission granted to add this module to our questionnaire.
- Curriculum for refresher nutrition training developed.
- Refresher course for nutrition training carried out over 5 days (March 5-10) (described in more detail below).
- Plans made to launch the "mid-term" survey (now scheduled for late April 2021, ~10 months later than originally planned).
- Presented work in progress (MILK PROJECT) in Virtual General Meeting for the Livestock Systems Innovation Lab September 2020
- Participated in LSIL Nepal platform meeting, March 16, 2020
- Work on previously completed NIL-funded project "Child health and nutrition after livestock interventions in rural Nepal: disaggregating the effects of social capital development and training inputs"

v) Publications:

- Miller LC, Neupane S, Joshi N, Shrestha M, Neupane S, Lohani M, Thorne-Lyman A. Dietary quality

is associated with better development in rural Nepali children. Maternal Child Nutrition, DOI: 10.1111/mcn.12964, 2020.

- Miller LC, Neupane S, Joshi N, Lohani M. Milk consumption is associated with better height and weight in rural Nepali children over 60 months of age and better head circumference in children 24-60 months of age. Journal of Dairy Science, 103 (11), p.9700-9714, 2020. doi.org/10.3168/jds.2020-18289

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Manuscripts in Progress:

- Nutrition education as part of a multisectoral community development program improves women's hygiene practices and knowledge of infant and young child feeding (IYCF), but not their breast-feeding practices: comparison with women who received nutrition education alone

vi) Capacity Building:

Short-term training:

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained M	F	Didn't disclose	Total
Nepal	Nutrition training refresher (6 groups in 3 sites)		0	121	0	121
Nepal	1. Refresher on questionnaire administration 2. Introduction to new COVID impact module 3. COVID precautions in field and at household	Field enumerators	0	0	4	4
Nepal	Preparation for field activities in monitoring GHP adherence and reinforcing nutritional training for mothers in Intervention Group	MSc students from College of Applied Food and Dairy Technology, Kathmandu [CAFODAT]	2	0	0	2

viii) Issues and Concerns:

As with all researchers, our work was greatly affected by the COVID-19 pandemic. Due to the pause in research activities, our nutrition training had to cease, and our midline and endline surveys were postponed. In this longitudinal project, this has had a serious impact. (1) A number of the young children enrolled in our study at baseline have "aged out" of the developmental testing tool. This means that follow up developmental testing cannot be done on this subset of children. (2) A number of enrolled families have left the area due to economic hardships caused by COVID. We are attempting to prepare a roster of the remaining households. (3) The timeline for the nutrition intervention has been completely altered. (4) The pandemic has introduced a significant and unanticipated variable into the research; it remains to be seen how this will impact the results and the subsequent analysis.

Analyses were planned to (a) examine the relation between GHP adherence and dairy animal milk production, (b) explore if better animal hygiene translates to better household hygiene practices, (c) evaluate the impact of nutrition education on consumption of milk and other ASFs by children, (d) determine the amount and source of other dairy products consumed (curd, paneer, etc.) (e) assess maternal attitudes and

knowledge about milk and ASFs in relation to their feeding practices. None of this has been done due to COVID restrictions.

Frontline Workers Study (FLWs)

i) Description:

This study represents an in-depth assessment of the knowledge, attitudes, and practices of the network of individuals who work in different sectors at Village Development Committee (VDC) and ward level – interacting with households. The study is linked to the frontline worker survey conducted in late 2015 to determine the effectiveness of USAID's Suaahara Project's approach to building the knowledge and skills of the FLWs, with a view to disseminating key program messages to the community. The latter study was conducted in a sub-sample of Suaahara sites; the present survey adopted the same instruments and applied them to PoSHAN sites surveyed in 2015 along with five "expansion" districts where Suaahara began to operate from 2015 onward.

ii) Locations:

13 districts: Jumla, Arghakhanchi, Doti, Dadeldhura, Baitadi, Achham, Banke, Nawalparasi, Morang, Saptari, Dhanusa, Sarlahi and Bara.

iii) Collaborators:

Save the Children, IFPRI, Patan Academy of Health Sciences, Hellen Keller International, Valley Research Group and Tufts University.

iv) Accomplishments:

- First of the 3-series infographics for the Frontline Workers study has been finalized (see Appendix 1).
- First of the 3-series brief for the Frontline Workers study has been finalized after feedback and revision from concerned stakeholders in Nepal, and the other two briefs are being reviewed.
- Similarly, a draft of the AAMA qualitative report that assessed the sustained activities of a combined home garden, poultry, and nutrition education intervention in Kailali, Baitadi, and Bajura districts of far western Nepal, using focus group discussions and in-depth interview methods from a total of 114 AAMA program implementers and beneficiaries across three intervention districts of Nepal.

v) Presentations and Publications:

Publications:

- Finalization of a summary report for FLW is underway.
- The manuscript for the Frontline Workers Study is in its final stages. The manuscript will be submitted to Human Resources for Health.

Uganda Panel Survey

i) Description:

The Uganda Panel Survey assesses the linkages between agriculture, food security, nutrition and health among women and children in rural Ugandan households. The panel surveys were conducted to determine if, and how, the USAID Uganda Community Connector (UCCP) has improved production practices, incomes, and nutrition. Panel surveys were conducted by holding face-to-face interviews with households and by taking anthropometric measurements and an assessment of anemia and malaria using rapid diagnostic kits.

ii) Locations:

Agago, Dokolo, Kole, Lira, Kamwenge, Kisoro (Uganda).

iii) Collaborators:

Makerere University, Harvard, and International Food Policy Research Institute (IFPRI) and Tufts.

iv) Accomplishments:

Several manuscripts based on findings from survey data are underway and are currently progressing well. More details can be found below.

v) Presentations and Publications

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Nassul Kabunga	NIL Webinar-Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda	Virtual	Evaluation of the USAID Community Connector Program in Uganda	May 12, 2021	377
Nassul Kabunga	NIL Legacy Event	Virtual	Evaluating a Large-Scale Multisectoral Ag-Nutrition Initiative	Sep. 16, 2021	332

Manuscripts Developed: Work began on analysis and a manuscript on multisector programming in Uganda which evaluates the effectiveness of the Uganda Community Connector Program to reduce malnutrition among vulnerable populations (women and children).

- A maternal DDS and BMI paper "Maternal Dietary Diversity and Body mass index (BMI) in Northern versus Southwestern Uganda: Understanding the relationship within the context of the double burden of malnutrition – a panel survey between 2012 – 2016" is underway. In the following months still working with the statistician on the results section and displaying and interpretation of results. We have completed a first draft of the introduction and methods sections. Next steps are to have a call with the team and review the direction of the work done so far, discuss the results section and detail, and formulate discussion points.
- A manuscript titled, "Production Diversity, Markets and Diet Diversity: Unpacking the Relationships Using Household Panel Data from Uganda," is also underway. A draft of the introduction and methods sections is currently being reviewed by the team, and the interpretation of results is in progress.

Bangladesh Aquaculture and Horticulture for Nutrition Study

i) Description:

Linking agriculture and health for dietary diversity, income, and nutrition.

ii) Locations:

Dhaka, Khulna, Barisal (Bangladesh).

iii) Collaborators:

Helen Keller International (HKI), Data Analysis and Technical Assistance (DATA) Ltd., Bangladesh Agriculture University, WorldFish, AquaFish Innovation Lab, Dhaka University, Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING), CIMMYT.

iv) Accomplishments:

During the reporting period, two papers were published. The first paper, in *Nature Food,* used a three-country analysis to examine contemporaneous and lagged effects of animal source foods (ASF) consumption on nutrition outcomes (stunting). To our knowledge, this is the first instance of rigorous empirical evidence demonstrating the protective effects of ASFs intake measured over varying time periods. Given the ongoing global debate about the negative contribution of ASF consumption and climate change, this study warrants a rigorous evidence-based understanding of the role of meat and other forms of ASF in the diets of undernourished children in resource-poor settings is more critical than ever.

A second paper that looked at the determinants of anemia in women of reproductive age in Southwest Bangladesh was published in the Maternal and Child Nutrition journal in October 2021. This paper assesses the relationship between maternal dietary diversity, consumption of specific food groups and markers of nutritional status, including underweight [body mass index (BMI) < 18.5 kg/m2], overweight (BMI ≥ 23 kg/m2) and anemia (haemoglobin < 120 g/dl) among women of reproductive age group (WRA) in Bangladesh. Among WRA, the prevalence of underweight, overweight and anaemia was 13.38%, 40.94% and 39.99%, respectively. Women who consumed dark green leafy vegetables (DGLV) or eggs were less likely to be anaemic or underweight, respectively, and women who consumed ASFs, particularly fish, were less likely to be underweight compared with women who did not consume these foods. The paper highlights those interventions that focus on promoting optimal nutritional status among WRA in Bangladesh should emphasize on increasing consumption of specific nutrient-rich foods, including ASFs, DGLV and eggs, rather than solely focusing on improving diet diversity in general.

In addition, a joint analysis with CIMMYT Bangladesh on characterizing farming households' typologies based on the production data and linking them to consumption data (from own production and market purchase) to examine the relationship with food availability and diet quality (macro and micronutrient) is ongoing. The approach will closely follow and build on previous simulation models by Lopez-Riadura et al. that demonstrated use of farming systems typologies and an innovative food security model.

Two more manuscripts, one on "Determinants of Food Safety and Quality Concerns in Bangladesh" focuses on consumer concern about food safety and its determinants in rural Bangladesh, and the second one on the pilot study of a chimney dryer technique are being finalized for co-author's reviews and submission to peer-reviewed journals.

v) Presentations and Publications:

Publications

Zaharia, S., Ghosh, S., Shrestha, R. et al. Sustained intake of animal-sourced foods is associated with less stunting in young children. Nat Food 2, 246–254 (2021). https://doi.org/10.1038/s43016-021-00259-z

Andrews, C., Shrestha, R., Ghosh, S., Appel, K., Gurung, S., Ausman, L. M., Marino Costello, E., & Webb, P. (2021). Consumption of animal source foods, especially fish, is associated with better nutritional status among women of reproductive age in rural Bangladesh. *Maternal & Child Nutrition*, e13287. https://doi.org/10.1111/mcn.13287

Manuscripts in the Final Phases

- NIL collaborator in Bangladesh, Dr. Saiful Md. Islam has continued to work on the manuscript titled "Determinants of Food Safety and Quality Concerns in Bangladesh" that focuses on the consumers concern about food safety and its determinants in rural Bangladesh.
- An analysis on impact of household livestock production on child growth and nutritional status in Southern Bangladesh by Saiful Islam is underway.
- Similarly, a comprehensive techno-economic performance evaluation on solar powered UCD chimney dryer for drying vegetables, fruits, and fish in Bangladesh is ongoing.
- An analysis exploring the population level effect on household income (expenditures) and household dietary diversity on households of exposure to none, one or more interventions targeting improved aquaculture or horticulture practices and nutrition behaviors is ongoing.

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Katie Appel	NIL Webinar-Effectiveness of Multisectoral Programming	Virtual	Implications of Aquaculture and Horticulture Engagement in Bangladesh	May 12, 2021	377
Rumana Akter	NIL Webinar-Innovative Metrics of Diet Quality in Low- and Middle-Income Settings	Virtual	Assessing Diet Quality Using Different Metrics	June 9, 2021	323
Saiful Islam	NIL Legacy Event	Virtual	Unpacking the Determinants of Food Safety and Quality Concern Dynamics: Evidence Using Panel Data from Rural Bangladesh	Sep. 17, 2021	332

vi) Capacity Building

A Nutrition Innovation Lab webinar, "Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda" was held on May 12, 2021. The webinar included a presentation on data and findings from the Bangladesh Aquaculture and Horticulture Nutrition Study.

Homestead Agriculture and Nutrition (HANU)

i) Description:

The ME at Tufts has always sought to leverage appropriate resources and data analyses where the questions posed are directly relevant to NIL research priorities. One productive example has been NIL support (through its Harvard University core partner) of studies in Tanzania that include new datasets on agriculture, diets and nutrition.

Objective 1: Contribute to data analyses and publications.

Objective 2: Provide Capacity Building Support for Tanzania in analysis of agriculture and nutrition data.

ii) Location:

Tanzania

iii) Collaborators:

Homestead Agriculture and Nutrition Project (HANU), Harvard Chan, Ifakara Health Institute (IHI), Sokoine University of Agriculture (SUA).

iv) Accomplishments:

In the period under review, collaborators from the Harvard T.H. Chan School of Public Health (Harvard Chan), the Ifakara Health Institute (IHI) and Sokoine University of Agriculture (SUA) have worked to advance research in the area of homestead food production and nutrition. The teams led research on the role of food systems and women's empowerment in ensuring diet quality for women. Additionally, a postdoc scholar on the team was invited to speak on "Measures of maternal diet quality in low- and middle-income countries" at the Nutrition Innovation Lab webinar on Metrics on Diet Quality in June 2021 and presented findings from our work at the NIL Legacy Event in September 20201.

v) Presentations and Publications:

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Isabel Madzorera	NIL Webinar- Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia	Virtual	Diet Quality for Women in Tanzania and its Determinants	Nov. 4, 2020	321
Wafaie Fawzi	NIL Webinar- Assessing Predictors and Metrics of Diet	Virtual	Session moderator	Nov. 4, 2020	321

	Quality in Sub-Saharan Africa and South Asia				
Isabel Madzorera	GLOBAL FOOD+ 2021 Webinar	Virtual	Food Systems and Distance to Markets Influence Diet Quality for Women: Evidence from Tanzania	Feb. 19, 2021	Unknown
Isabel Madzorera	NIL Webinar- Innovative Metrics of Diet Quality in Low- and Middle-Income Settings	Virtual	Innovative Metrics for Measuring Diet Quality for Women in Low and Middle-Income Countries	June 9, 2021	323
Isabel Madzorera	NIL Legacy Event	Virtual	Women's Diet Quality: Measurement, Role of Food Systems and Implications for Child Health Outcomes	Sep. 16, 2021	332

Presentations in Progress:

An abstract on the women's empowerment and diet quality work among women in Tanzania was submitted for the Agriculture and Nutrition and Health (ANH) conference to be held from 21 June - 2 July 2021.

Publications:

- We published a manuscript of the importance of diversifying food crop production, women's income-earning activities and distance to markets in relation to maternal dietary quality in rural Tanzania. Findings of this research include that diversified on-farm food crop production and women's access to income were important factors influencing diet quality for rural women. We also found that when women lived far away from markets this negatively affected the quality of their diets. The manuscript was published in a peer reviewed journal, the *Journal of Nutrition*.
  Madzorera I, Blakstad MM, Bellows AL, Canavan CR, Mosha D, Bromage S, Noor RA, Webb P, Ghosh S, Kinabo J, Masanja H, Fawzi WW, 2020. Food Crop Diversity, Women's Income-Earning Activities, and Distance to Markets in Relation to Maternal Dietary Quality in Tanzania. *The Journal of nutrition, 151*(1), 186–196. https://doi.org/10.1093/jn/nxaa329
- We developed a manuscript that summarizes importance of food systems as drivers of optimal nutrition and health. This manuscript provided a summary of the proceedings of the conference on "10th Annual Nutrition and Global Health Symposium on "Food Systems as Drivers of Optimal Nutrition and Health," held at the Harvard T. H. Chan School of Public Health in Boston, MA, USA;

November 20, 2019. The manuscript was recently accepted for publication by the Current *Developments in Nutrition* journal.

Madzorera I, Jaacks L, Paarlberg R, Herforth A, Bromage S, Ghosh S, Myers S, Masters W, Fawzi WW. **Food systems as drivers of optimal nutrition and health – Complexities and opportunities for research and implementation.** *Current developments in nutrition*, 5(Suppl 3), nzab062. https://doi.org/10.1093/cdn/nzab062

Analyses in Progress:

- We have conducted research and developed a manuscript on the role of women's empowerment in women's diet quality in Tanzania for publication in a peer reviewed journal. Findings from this work include that women's participation and input in decision-making around economic domains of wage and salary employment, livestock production and minor household expenditures were strongly associated with consumption of better-quality diets. Additionally, women participating in multiple farm activities were also likely to have better diet quality. This study adds to the growing evidence around the different pathways through which activities related to women's empowerment may influence nutrition for women in parts of rural Africa. The manuscript is undergoing peer review ahead of submission for publication in the Lancet Clinical Medicine journal.

  Madzorera I, Bliznashka L, Blakstad M, Bellows AL, Mosha D, Canavan CR, Bromage S, Noor RA, Webb P, Ghosh S, Kinabo J, Masanja H, Fawzi WW. **Women's participation, inputs and decision making in agriculture are associated with women's diet quality in rural Tanzania**. (2021) (for submission to Lancet Clinical Medicine Journal).

- Association between infant environmental enteric dysfunction and subsequent linear growth in Tanzania.

  This paper will examine biomarkers of EED measured at 6 weeks and 6 months of age and examine relationships to LAZ at 12 months of age. Specifically, biomarkers of EED will include anti-flagellin/anti-LPS Igs and a novel multiplex (MEEDAT) which includes sCD14, I-FABP, and several biomarkers of systemic inflammation, growth, and nutrition. Infants were born to HIV positive mothers enrolled in a randomized trial of Vitamin D supplementation.
- Association between infant environmental enteric dysfunction and subsequent neurodevelopment in Tanzania.

  Utilizing the same study population and biomarkers described above, we will examine the relationship between biomarkers of EED and neurodevelopment at 12 months of age utilizing the Caregiver-Reported Early Development Index (CREDI).
- Association between environmental enteric dysfunction during pregnancy and birth outcomes in Tanzania.

  Utilizing serum samples collected from women at 32 weeks gestation enrolled at the Vitamin D trial described above, we will examine the association between biomarkers of EED and birth outcomes,

specifically birth weight and duration of gestation. The same biomarkers of EED described above will also be examined in this study.

- The team also started to work on research metrics of overall diet quality in children and evaluate associations between diet quality for children with child growth outcomes, as well as child nutrition outcomes such as anemia in Tanzania.

Additionally, a postdoctoral fellow supported by NIL, and mentored by Dr. Christopher Duggan, is a co-author or co-first author on the following papers that are in preparation:

- Food Security, Dietary Intake, and Nutritional Status among Women Living in Four Low- and Middle-Income Countries. (co-author)
- Effects of an LPG stove and fuel intervention on preterm birth: a multi-country randomized controlled trial (co-first author)

vi) Capacity Building:

Long-term training:

Dr. Duggan is currently supporting a second NIL-supported postdoctoral fellow to assist in further data analysis, manuscript preparation, and dissemination of results. This postdoctoral fellow has been receiving training and mentoring in global nutrition, child growth, neurodevelopment, and environmental enteric dysfunction.

Trainee Number	Sex	University	Degree	Major	Program End Date (month/year)	Degree Granted (Y/N)	Home Country
3	M	HSPH	Post-Doc	Post-Doc	08/2021	No	USA

vii) Future Work

We plan submit the article on women's empowerment and women's diet quality in Tanzania for publication in a peer reviewed journal. The team will also conduct research on measures of overall diet quality in children and evaluate associations between diet quality for children with child growth outcomes, as well as child nutrition outcomes such as anemia in Tanzania.

AflaCohort Study, Nepal

i) Description:

Maternal Exposure to Mycotoxins, Birth Outcomes and Stunting in Infants

This study considers the impact of mycotoxin exposure (maternal and infant) on birth outcomes and length-for-age. The study also seeks to validate the use of low-cost data collection methods (e.g., dried blood spots versus venous blood samples) for mycotoxin analysis.

The specific aims of this study are:

1. To examine links between maternal mycotoxin exposure in pregnancy and birth outcomes, including birth weight.
2. To examine the relationship of exposure to mycotoxin of infants through breast milk and their linear growth.
3. To examine the relationship of exposure to mycotoxin through complementary feeding and linear growth.
4. To enumerate the relative contributions of maternal and infant mycotoxin exposure in impairing linear growth and cognitive development, controlling for other potential explanatory factors.
5. To examine dietary exposure to mycotoxins from a sub sample of households via collection and analysis of commonly consumed crops such as maize, chilies, rice and groundnuts.

ii) Locations:

Banke district, Nepal.

iii) Collaborators:

Tufts University's Friedman School of Nutrition Science and Policy leads the study in collaboration with the Patan Academy of Health Sciences, Helen Keller International, Purdue University, Nepalgunj Medical College and the Government of Nepal. The study is generously supported by the United States Agency for International Development, Bureau of Food Security and USAID Mission in Nepal.

iv) Accomplishments:

The Nepal Health Research Council (NHRC) approved the third phase of the Aflacohort study (clinicaltrails.gov identifier: NCT03312049). Additionally, the FTF-Nepal team successfully shipped a total of 2927 serum samples to the Nutrition Evaluation Laboratory at Human Nutrition Research Center on Aging (HNRCA), Boston, USA. These samples were sub-aliquoted and were tested for micronutrient status and inflammatory markers' testing.

Two papers were published, and one paper was accepted for publication during the reporting period. A paper by Johanna Andrews Trevino et al. on *AJCN* titled, "Aflatoxin exposure and child nutrition: measuring anthropometric and long-bone growth over time in Nepal" analyzed the relationship between contemporary

and lagged aflatoxin exposure and length-for-age score (LAZ), weight-for-age-score (WAZ), knee-heel length, stunting and weight-for-length-score (WLZ). The analysis found changes in contemporary logged AFB_1-lysine adduct concentrations in children to be significantly associated with changes in LAZ (β , −0.05; 95% CI, −0.09 to −0.02; $P = 0.003$), length (β , −0.19; 95% CI, −0.29 to −0.10; $P < 0.001$), knee-heel length (β , −0.09; 95% CI, −0.13 to −0.05; $P < 0.001$), and WAZ (β , −0.04; 95% CI, −0.07 to −0.005; $P = 0.022$). Serum aflatoxin concentrations were associated with stunting (OR, 1.18; 95% CI, 1.05-1.32; $P = 0.005$). Similar results were found in the models using changes in contemporary logged AFB_1 adjusted for changes in child weight, with significant associations with changes in WLZ (β , −0.07; 95% CI, −0.10 to −0.03; $P < 0.001$). Changes in time-lagged logged AFB_1 (unadjusted and adjusted for changes in child weight) were associated with changes in length and knee-heel length. Our results add to the growing body of evidence confirming chronic aflatoxin exposure and suggest that exposure is significantly correlated with various negative growth outcomes, which may vary by child weight status.

The second paper, published in *Food Control* journal studies the prevalence of AFM1 aflatoxin in human breast milk and assessed the factors associated with it. Approximately 94% of BM samples had detectable levels of AFM1 (geometric mean 0.78 ng/L and range 0.04 ng/L to 315.99 ng/L). The consumption of particular foods such as yogurt, milk, hydrogenated oil and ripe pumpkin was positively associated with BM AFM1 levels (p-value <0.05), while consumption of legumes was associated with lower BM AFM1 levels (p-value <0.05). Seasonal influences were significant, with BM collected in the pre-winter and winter seasons exhibiting significantly higher AFM1 levels compared to the spring (p-value <0.05). These results suggest near-ubiquitous presence of aflatoxin in the food supply of this part of Nepal, and possible exposure of AFM1 to infants through BM of mothers. The findings justify integrated strategies across the value chain and at household level to identify dietary sources of aflatoxin exposure, proper post-harvest management and monitoring for aflatoxin control and mitigation.

A third paper aims to a) quantify exposure to multiple mycotoxins (serum aflatoxin (AFB_1) and ochratoxin A (OTA), urinary fumonisin (UFB_1) and deoxynivalenol (DON)), as well EED using L:M ratio; and b) examine the additive and/or synergistic relationships of multiple mycotoxin exposure and EED on child growth. Multivariate linear and logistic regressions were used to identify associations between child growth measurements (length, weight, z-scores, stunting, and underweight) at 24-26 months of age and exposure to mycotoxins as well as EED at 18-22 months (n=699). Prevalence of AFB_1, DON, OTA and UFB_1 exposure ranged from 85% to 100%. The average L:M ratio was 0.29 ± 0.53. In single mycotoxin models, AFB_1 exposure was negatively associated with child weight and with increased odds of stunting (OR 1.28; 95% CI: 1.08, 1.52; p=0.004) and underweight (OR 1.18; 95% CI: 1.00, 1.38; p=0.046). In models including multiple mycotoxins, AFB_1 was negatively associated with length, weight, head circumference and with increased odds of stunting and underweight. UFB_1 was associated with increased odds of underweight. DON was negatively associated with child head circumference (β: −0.05 cm; 95% CI: −0.10, −0.002 cm; p=0.044). AFB_1 exposure was associated with stunting and underweight, irrespective of other mycotoxin exposure and presence of EED. These findings suggest that programs aimed at mycotoxins exposure reduction in conjunction with multisectoral nutrition interventions, could support improved child growth. This paper has been accepted for publication in the Journal of *Maternal Child and Nutrition* (December 2021).

In addition, the Nutrition Lab finalized two additional papers for submission to the peer reviewed journal. The first manuscript is in the early life animal source food consumption and its association with the markers of growth and child development at 24 months of age. This paper is in final draft form. The second analysis explored the relationship of maternal and child's exposure to aflatoxin, inflammation status of mother and child and maternal and early child growth factors on nutrition outcomes. This analysis is being finalized

v) Presentations and Publications

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Shibani Ghosh	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	The Association Between Animal Sourced Food Consumption and Metrics of Child Growth and Development	Feb. 3, 2021	556
Shibani Ghosh	NIL Webinar-Mycotoxins, Environmental Enteric Dysfunction, and Inflammation: Implications for Research and Programming on Child Growth and Nutrition	Virtual	Mycotoxins, the Microbiome and Environmental Enteric Dysfunction	Apr. 28, 2021	256
Johanna Andrews-Trevino	NIL Legacy Event	Virtual	Exposure to Multiple Mycotoxins, Environmental Enteric Dysfunction and Child Growth in Banke, Nepal	Sep. 17, 2021	332

Publications

- Andrews-Trevino, J. Y., Webb, P., Shively, G., Kablan, A., Baral, K., Davis, D., Paudel, K., Shrestha, R., Pokharel, A., Acharya, S., Wang, J. S., Xue, K. S., & Ghosh, S. (2021). Aflatoxin exposure and child nutrition: measuring anthropometric and long-bone growth over time in Nepal. *The American Journal of Clinical Nutrition*, *113*(4), 874–883. https://doi.org/10.1093/ajcn/nqaa397
- Pokharel, A., Webb, P., Andrews-Trevino, J., Lamichhane, A., Shrestha, R., Acharya, S., Davis, D., Baral, K., Wang, J. S., Xue, K., Paudel, K., & Ghosh, S. (2021). Prevalence and associated factors of breastmilk

aflatoxin M1 levels in mothers from Banke, Nepal. *Food Control*, 126, 108069. https://doi.org/10.1016/j.foodcont.2021.108069

Publications in Progress

- Manuscript examining the relationship between aflatoxin B1 (AFB1) in Nepali infants at 12 months of age and their diet at 9 and 12 months of age titled "Fruit consumption is associated with lower serum aflatoxin levels in Nepalese infants aged 9-12 months."
- Manuscript examining the relationship between aflatoxin exposure and growth outcomes in infants titled "Aflatoxin exposure and growth outcomes in infants at three months of age: A cross-sectional study in Banke District, Nepal."
- A manuscript draft on the use of dried blood spots as a field friendly method to assess aflatoxin exposure was drafted for co-author's review is under review at the *Biomarkers* journal.
- A manuscript draft on animal source food consumption and developmental outcomes is on-going. This analysis uses the data on Ages and Stages Questionnaire (ASQ), a screening tool, to assess children's developmental performance, collected at 24-26 months of age, along head circumference and LAZ score at 24 months as key outcome variables to test the association between past animal source food consumption. More information on the results and findings will be shared in subsequent monthly updates.

FTF-NIL Nepal planned an event to share and discuss the findings from its research activities in Nepal over the years, followed by a roundtable discussion on the policy level implications of the findings and future activities. Given the pandemic, this was undertaken in the form of a virtual in September 2021.

Lastly, the FTF-NIL Nepal team donated all anthropometric equipment including Shorr height boards, Seca digital weighing scales to the Family Welfare Division of the Ministry of Health and Population, Government of Nepal.

The Birth Cohort Study in Uganda

i) Description:

The Uganda Birth Cohort Study examines the effect of interventions that integrate nutrition, health, agriculture, and livelihoods on maternal and child nutritional outcomes.

Specific Aim 1

The Micronutrient Study: To determine the relationship between maternal iron, vitamin A biomarkers (ferritin, soluble transferrin receptor, body iron index, Hemoglobin and retinol binding protein) and birth outcomes (body weight, z scores, head circumference, small-for-gestational-age and preterm birth) after adjusting for relevant factors.

Specific Aim 2

The Growth Pattern Study: To identify the patterns of growth in Ugandan children and associated risk factors.

Specific Aim 3
The Aflatoxin Study: To explore the relationship between aflatoxin exposure and birth outcomes

Specific Aim 4:
Exclusive Breast Feeding Study: To explore the relationship between exclusive breast feeding and infant growth in an aflatoxin environment

Specific Aim 5: To assess the effect of maternal factors (biological) at birth and infant factors at 6 months (biological) on infants' linear growth from 6 to 12 months of age.

ii) Locations:

Nine districts of Northern Uganda and six districts of Southwestern Uganda.

iii) Collaborators:

Makerere University, Harvard T.H. Chan School of Public Health (Harvard Chan), International Food Policy Research Institute (IFPRI), Boston Children's Hospital (BCH), and Tufts.

iv) Accomplishments:

- The manuscript for Specific Aim 1 entitled, "Iron and Vitamin A Levels in Pregnant Women and Birth Outcomes: Results from a Birth Cohort Study in Uganda" is under active review in the BMC – Maternal and Child Health Journal
- The manuscript for Specific Aim 2 entitled, "Child Stunting Starts in Utero: Growth Trajectories and Determinants in Ugandan Infants" is under active review in Maternal and Child Nutrition.
- A manuscript covering Specific Aims 3 and 4 is under active review by internal coauthors.
- Specific Aim 5 has posed a challenge. The investigators are seeking to determine if there are any biologic or environmental factors that specifically contributed to the linear portion of growth from 6 to 12 months.
- The UBCS and Panel Study have generated a wealth of data on agriculture, nutrition, and health linkages in rural Uganda and allow detailed investigation of mechanisms by which integrated interventions impact maternal and child nutritional outcomes. Looking forward, HSPH/BCH remains committed to the publication of manuscripts using data collected from the UBCS as well as to the dissemination of study results both in high-impact journals as well as at relevant academic conferences. Furthermore, HSPH/BCH continues to look for ways of leveraging additional funding to continue research on the impacts of EED on birth outcomes, child growth, and morbidity, and the intersections between and policy-relevant interventions important to agriculture, nutrition, and health in Africa.

v) Presentations and Publications

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Shibani Ghosh	U.S.G. Global Nutrition Coordination Plan Webinar	Virtual	Mycotoxin Exposure and Nutritional Status in the First 1000 Days	Apr. 1, 2021	Unknown
Christopher Duggan	NIL Webinar- Mycotoxins, Environmental Enteric Dysfunction, and Inflammation: Implications for Research and Programming on Child Growth and Nutrition	Virtual	Mycotoxins, EED, and Inflammation	Apr. 28, 2021	256
Lynne M. Ausman	NIL Webinar- The Role of Micronutrients in Child Growth and Development	Virtual	Iron and Vitamin A Levels in Pregnant Women and Birth Outcomes	May 19, 2021	638
Lynne M. Ausman	3rd All Africa Postharvest Congress and Exhibition	Virtual	Maternal aflatoxin exposure decreases infant weight and WAZ at birth whereas exposure from breastmilk was not associated with growth impairment from 3 to 6 months in exclusively breastfed infants	Sep. 16, 2021	Unknown
Jacqueline Lauer	NIL Legacy Event	Virtual	Environmental Enteric Dysfunction and Undernutrition: New Insights and Ongoing Challenges	Sep. 17, 2021	332

Submitted Publications

- "Iron and Vitamin A levels in pregnant mothers and birth outcomes: results from the Uganda Birth Cohort Study". Authors: Julieta Mezzano, Grace Namirembe, Lynne M. Ausman, Elizabeth Marino-Costello, Robin Shrestha, Juergen Erhardt, Patrick Webb and Shibani Ghosh. Under active review in

Maternal and Child Health Journal.

- "Child Stunting Starts in Utero: Growth Trajectories and Determinants in Ugandan Infants". Authors: Namirembe G, Mezzano J, Ausman LM, Marino-Costello E, Shrestha R, Ghosh S, Webb P. Under active review in Maternal and Child Nutrition

Manuscripts in Progress

- Maternal aflatoxin exposure decreases infant weight and WAZ at birth whereas exposure from breastmilk was not associated with growth impairment from 3 to 6 months in exclusively breastfed infants. Ausman LM, Liang L, Namirembe G, Mezzano J, Marino-Costello E, Shrestha R, Lauer J, Bashaasha B, Agaba E, Griffiths J, Jia Sheng Wang, Erhardt J, Webb P, Ghosh S.

Mozambique Aflatoxin Survey

i) Description:

This project aimed to assess the aflatoxin levels in children 6 to 59 months old in Nampula province, Mozambique and to enumerate the association with stunting/height for age in the children. The project was conducted through buy-in support from the USAID mission in Mozambique.

Specific Aim 1: Assess the mean serum aflatoxin in children 6-23 months and 24-59 months of age.

Specific Aim 2: Examine differences in serum aflatoxin (mean) by age group.

Specific Aim 3: Enumerate the association between serum aflatoxin and linear growth adjusting for confounders.

ii) Locations:

10 districts in Nampula Province, Mozambique.

iii) Collaborators:

University Lúrio (UniLúrio), Association for Food and Nutrition Security (ANSA), National Institute of Health (INS).

iv) Accomplishments:

- The study report describing the enumeration of serum aflatoxin B1 (AFB1) in children 6-59 months of age and estimation of its association with linear growth in these children was finalized in both English and in Portuguese.
- Two webinars were held in May and June of 2021 in Portuguese and English, respectively. Findings from the study were shared during these webinars, including the relationships found

between children's height and aflatoxin, as well as agricultural and dietary contributors to increased aflatoxin levels.

- Draft manuscript was finalized

v) Reports and Publications

Presentations

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Sofia Costa	NIL Webinar- Avaliação da Relação entre a Exposição à Aflatoxina e a Desnutrição Crónica em Crianças de 6-59 Meses de Idade em 10 Distritos na Província de Nampula em Moçambique	Virtual	Avaliação da Relação entre a Exposição à Aflatoxina e a Desnutrição Crónica em Crianças de 6-59 Meses de Idade em 10 Distritos na Província de Nampula em Moçambique	May 26, 2021	45
Sofia Costa and Katie Appel	NIL Webinar- The Relationship Between Aflatoxin Exposure and Chronic Malnutrition in Nampula Province, Mozambique	Virtual	The Relationship Between Aflatoxin Exposure and Chronic Malnutrition in Nampula Province, Mozambique	Jun. 10, 2021	124

Reports

- Assessing the Relationship of Aflatoxin Exposure and Stunting in Children 6-59 Months of Age in 10 Districts of Nampula Province, Mozambique (Study Report). 2021. https://dl.tufts.edu/concern/pdfs/9s161m40p
- Avaliação da Relação entre a Exposição à Aflatoxina e a Desnutrição Crónica em crianças dos 6 aos 59 meses em 10 Distritos na Província de Nampula, Moçambique (Study Report). 2021. http://hdl.handle.net/10427/6108VS18W

Secondary Analysis of Timor-Leste Food and Nutrition Survey on Aflatoxin Exposures

i) Description:

The 2014 Timor-Leste Food and Nutrition Survey (TLFNS) offers an unparallel opportunity to explore if aflatoxin levels in women and children correlate with their nutritional status. The main survey included a nationally representative sample of over 9,000 children (aged 5 and under) and roughly 8,500 non-pregnant women. In addition to the usual height and weight measures taken to assess nutrition, blood samples were drawn from a sub-sample of approximately 1,300 mother-child pairs and assessed for the presence of aflatoxin exposure. These samples were also analyzed for micronutrient deficiencies (iron and Vitamin A).

The data used include children aged 6-59 months and non-pregnant mothers with biochemical data on micronutrients as well as serum aflatoxin. We also collected anthropometric measurements, converted them to z-scores using the WHO standards and log transformed the AFB1 data for analysis.

ii) Locations:

Timor-Leste

iii) Collaborators:

Ministry of Health, University of Jakarta, UNICEF, University of Indonesia

iv) Accomplishments:

Data analysis using the cross-section data continued during this reporting period. The ongoing cross-sectional analytical data analysis that aims to study the relationship of aflatoxins exposure and nutritional status (height-for-age Z-score), adjusting for weight of the child, age, wealth, education, and inflammation, started in June 2020. The Nutrition Lab found that in over 500 children for which we had data for serum aflatoxin, the detectable rate was found in 83%. Significant negative association was found between AFB1 concentrations adjusted for weight and LAZ, and significant positive association was found between AFB1 concentrations adjusted for weight and odds of stunting. Compared to aflatoxin levels from Mozambique and Uganda, the aflatoxin levels found in Timor-Leste are low.

v) Presentations and Publications:

The ME is in the process of finalizing a manuscript and a brief on the observed findings.

Objective 3: Study Household and Community Resilience

Understanding Resilience to Shocks

i) Description:

The focus of this research is to understand the issues of household risk, price volatility, and environmental and other shocks for agricultural development and program implementation. Under this new research portfolio, the Nutrition Lab has undertaken analyses to understand resilience post-earthquake in Nepal. In addition, analysis aimed at developing a novel method to measure resilience using multi-country panel data has started and the method has been applied to survey data on maternal and child diets from Nepal, Bangladesh, and Uganda.

ii) Locations:

The plains (Terai region) of Nepal and Feed the Future Zones of Influence in Uganda and Bangladesh.

iii) Collaborators:

Tufts University, Johns Hopkins University, and Makerere University.

iv) Accomplishments:

Two papers led by a post-doc (Sonia Zaharia) focused on developing a method to measure resilience from panel data and apply it to nutrition outcomes using a triple difference approach. The method is applied to measure nutritional resilience of women and children from the Terai region in Nepal and from the Feed the Future Zones of in Bangladesh. The key finding from the analysis was that dietary diversity of women and children is resilient in Nepal, but not in Bangladesh. We further explored how nutritional resilience in Nepal varies by household characteristics such as agricultural practices and market activity, and by the quality of local infrastructure. The resilience of diet diversity (DD) in Nepal could reflect food aid responses to the 2015 earthquake or other interventions, while lack of resilience in BMI could reflect time lags, measurement errors or limits on the speed and timing of weight change. Lack of resilience of DD in Bangladesh could reflect shorter time intervals. Future work will apply this method to test for differences in resilience associated with exposure to programmatic interventions. The paper was published in *Global Food Security Journal in* October 2021.

v) Publications and Presentations

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Will Masters	NIL Webinar- Measuring Resilience: An Approach Using Data from Nepal, Bangladesh, and Uganda	Virtual	Defining Resilience	Nov. 18. 2020	369
Sonia Zaharia	NIL Webinar- Measuring Resilience: An Approach Using Data from Nepal, Bangladesh, and Uganda	Virtual	A Method to Measure Resilience	Nov. 18, 2020	369
Will Masters	NIL Legacy Event	Virtual	Climate Shocks and Child Growth: What Have We Learned About When and How to Intervene?	Sep. 16, 2021	332

Submissions to Peer-Reviewed Journals:

- The manuscript, "Measuring Resilience as Asymmetric Mean Reversion" is under revision with the *Journal of Development Economics.*

Manuscripts in progress:

- The manuscript, "Recovery without resilience? Measuring transitory shocks to nutrition of women and children from Nepal, Bangladesh and Uganda" is in preparation for submission to *Global Food Security*.

III. Human and Institutional Capacity Development

Short-term training

A total of 2,019 individuals were trained across civil, government, public and private sectors.

Nutrition Innovation Lab Webinar Series							
Date	Focus Country of Training	Brief Purpose of Training	Sector trained	Number trained			
				M	F	Didn't disclose	Total

Oct. 7, 2020	Malawi	Dissemination Webinar: Malawi's First Dietetics Program: Institutional Capacity for Nutrition	Civil, Government, Public, and Private	60	179	0	239
Oct. 21, 2020	Malawi	Dissemination Webinar: The Malawi Food Composition Database (MAFOODS): Importance, Development Process, Applications, and Future Priorities)	Civil, Government, Public, and Private	79	140	7	226
Nov. 4, 2020	Tanzania, Nepal	Dissemination Webinar: Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia: The Intersection of Agriculture, Nutrition, and Health	Civil, Government, Public, and Private	112	190	19	321
Nov. 18, 2020	Nepal, Bangladesh, Uganda,	Dissemination Webinar: Measuring Resilience: An Approach Using Data from Nepal, Bangladesh, and Uganda	Civil, Government, Public, and Private	145	210	14	369
Feb. 3, 2021	Nepal	Dissemination Webinar: The Role of Diet in Early Child Development: Evidence from Nepal	Civil, Government, Public, and Private	153	393	10	556
Mar. 3, 2021	Ethiopia, Nepal	Dissemination Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Civil, Government, Public, and Private	114	186	8	308
Apr. 7, 2021	Nepal, Uganda	Sustainable Development of Institutional and Human Research Capacity for Nutrition	Civil, Government, Public, and Private	81	133	1	215
Apr. 28, 2021	Uganda, Nepal, Mozambique, Timor Leste	Mycotoxins, Environmental Enteric Dysfunction and Inflammation: Global Evidence on Child Growth and Nutrition (Uganda, Nepal, Mozambique, Timor Leste)	Civil, Government, Public, and Private	96	151	9	256

May 12, 2021	Nepal, Bangladesh, Uganda	Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda	Civil, Government, Public, and Private	184	185	8	377
May 19, 2021	Nepal, Uganda	The Role of Micronutrients in Child Growth and Development	Civil, Government, Public, and Private	223	402	13	638
May 26, 2021	Mozambique	A relação entre a exposição à aflatoxina e a desnutrição crónica na província de Nampula, Moçambique	Civil, Government, Public, and Private	19	26	0	45
Jun. 9, 2021	Tanzania, Bangladesh	Innovative Metrics of Diet Quality in Low- and Middle-Income Settings	Civil, Government, Public, and Private	117	205	1	323
Jun. 10, 2021	Mozambique	The Relationship Between Aflatoxin Exposure and Chronic Malnutrition in Nampula Province, Mozambique	Civil, Government, Public, and Private	49	75	0	124
Sep. 16-17, 2021	All NIL focus countries	NIL Legacy Event: Looking Beyond a Decade of Accomplishments in Nutrition	Civil, Government, Public, and Private	193	120	19	332

Bangalore Boston Nutrition Collaborative

Unfortunately, due to COVID-19, the Bangalore Boston Nutrition Collaborative (BBNC) course on nutrition research methods, which would have been held in January 2021, had to be cancelled.

Despite the cancellation of this year's BBNC course, two presentations were made to a global audience about the program during the NIL webinar on capacity building and the NIL legacy event in September 2021.

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					

Rebecca Kuriyan Raj	NIL Webinar- Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Bangalore Boston Nutrition Collaborative (BBNC)	Apr. 7, 2021	215
Rebecca Kuriyan Raj	NIL Legacy Event	Virtual	Building Sustainable Human Capacity in Asia and Africa: Bangalore Boston Nutrition Collaborative (BBNC)	Sep. 16, 2021	332

Long-term training

The Nutrition Innovation Lab is supporting 5 scholars (3 doctoral and 2 Post-doctoral) for graduate-level studies.

Trainee Number	Name (first, last)	Sex	University	Degree	Major	Program End Date	Degree Granted (yes / no)	Home Country
5	Sonia Zaharia	F	Tufts University	Post-Doctoral	Finance, Economics	2021	Yes	USA
11	Isabel Madzorera	F	Harvard TH Chan	Doctoral	Nutrition	2021	No	Zimbabwe
12	Tim Smith	M	Purdue University	Post-Doctoral	Nutrition	2021	No	USA
13	Alecia Evans	F	Purdue University	Doctoral	Nutrition	2021	No	USA
N/A	Edgar Agaba	M	Stellenbosch University	Doctoral	Nutrition	2021	No	Uganda

Nutrition Capacity Development to Meet National Priorities:

i) Description:

This project achieved its goals by building a sustainable pre-service nutrition education and nutrition training capacity in Malawi through guiding the development and implementation of a dietetics program sensitive to national needs and priorities; reviewed and created a document with recommendations to improve the existing medical curriculum for nutrition content (in partnership with national stakeholders), which can be adopted by targeted medical training institutions; and launched the first Malawian national food composition table.

ii) Locations:

Lilongwe University of Agriculture and Natural Resources (LUANAR), Lilongwe Malawi, College of Medicine.

iii) Collaborators:

The Department of Human Nutrition and Health at the Lilongwe University of Agricultural and Natural Resources (LUANAR) and the College of Medicine (COM), School of Public Health focus on the dietetics program. LUANAR and the South African Medical Research Council (SAMRC) work collaboratively to produce the first national Food Composition Table. The clinical medicine curricula will be reviewed for nutrition content in collaboration with COM. Stakeholders engaged across all the activities include the Ministry of Health, Department of Nutrition and HIV/AIDS (DNHA) and the directorate of clinical services. Additional stakeholders engaged in the implementation of the dietetics program are the Strengthening Agriculture and Nutrition Extension (SANE) and Baylor College of Medicine.

iv) Accomplishments:

The Malawian Food Composition Table (MFCT):

Plan in place for continual review and updating of the MFCT, and assisting researchers to use the MFCT the following activities were carried out:

- Supported individual researchers on how to use the MFCT to calculate nutrient intake and use the MFCT values of various foods to compare with their study results.
- Commenced a desktop literature review on newly published food composition data from 2018-2021, with the aim of collecting nutrient data for the second version of MFCT
- Compilation of the Malawi Food Quantities Manual ended in June 2021. The Food Composition data assistant has reviewed and developed methodology for compiling the Malawi Food quantities. In addition, foods in season have been purchased, and measuring of food items in household measures has started at LUANAR
- Food Composition Database Specialist completed master's degree and will continue managing the MFCT database.

The Dietetics Program Accomplishments:

Launch of the Dietetics Master's Degree Program

Seven students of the Dietetics Diploma program were enrolled and are being trained in the newly launched Dietetic Master's Program at LUANAR. The number of dietetic registered dietitians who are pursuing master's degree are an impressive 90%. The Masters students have successfully completed all coursework requirements and the thesis proposal development. Earlier in the year all student proposals were approved by the ethics and regulatory boards. All students submitted their final theses in September 2021. The Tufts team as well as the LUANAR faculty provided supervisory support to the students. LUANAR will plan for graduation in subsequent months after this grant has ended.

Transitioning and future of the dietetics program

Weekly sessions to transition all aspects of the Dietetics Program to the incoming LUANAR program management team was completed. A comprehensive handover timeline that included very specific program details had been endorsed and prioritized by LUANAR senior management. Implementation of the plan began in March 2021 and ended in July 2021. For additional funding beyond this year, the Tufts team has provided technical support to the LUANAR team with the grant application titled 'Leveraging Local Capacity to Strengthen Health Service Delivery Project'. LUANAR has been awarded the new funding which will be used to support the Dietetics Program an additional 5 years.

Dietetics Program curriculum and sustainability consultancy

The Dietetics Program curriculum external consultants have completed a very preliminary draft report. The report which was submitted to LUANAR administration provides recommendations on individual courses, human resource needs, recruitment, assessment procedures and infrastructure among other key program elements. Our team had an opportunity to provide comments back to the consultants and a final report was submitted to LUANAR. Once in, these recommendations should be used to inform changes in the design of the program.

Activities on the Medical Curriculum:

The *"Nutrition education, knowledge, attitudes, and practices among physicians in hospitals in Malawi: A baseline cross-sectional study (The Medical Nutrition Education KAP study)"* survey had undergone ethical review pre-screening by both College of Medicine Research Ethics Committee (COMREC) and Tufts IRB. Tufts IRB and COMREC provided approval for the study earlier in the year.

Data collection has been completed and due to lack of response, had to proceed with the exclusion of Queen Elizabeth Central Hospital (QECH) as a primary site. Due to COVID-19 the clinical coordinator experienced challenges in obtaining the final approval letter from QECH in Blantyre as one of the primary sites for recruitment of study participants. The participant sites included one tertiary hospital and 4 secondary care hospitals. Data collection took a total of two months to complete.

v) Presentations and Publications:

Presentations:

Presenter	Event	Location	Topic	Date	Audience
Oral presentations					
Sanele Nkomani	NIL Webinar- Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and institutional capacity for nutrition	Virtual	Malawi's First Dietetics Program: Key achievements, lessons learned and future directions	Oct. 7, 2020	239
Bernadette Chimera-Khombe	NIL Webinar- Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and institutional capacity for nutrition	Virtual	State of Nutrition in Malawi	Oct. 7, 2020	239
Lynne Ausman	NIL Webinar- Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and institutional capacity for nutrition	Virtual	Nutrition Capacity Development to Meet National Priorities	Oct. 7, 2020	239
Averalda van Graan	NIL Webinar- The Malawi Food Composition Database (MAFOODS): Importance, development process, applications, and future priorities	Virtual	Reflecting on the Development and Establishment of a Food Composition Database and System for Malawi	Oct. 21, 2020	226
Stevier Kaiyatsa	NIL Webinar- The Malawi Food Composition Database (MAFOODS): Importance, development process, applications, and future priorities	Virtual	Use of the Malawi Food Composition Database (MAFOODS)	Oct. 21, 2020	226
Sanele Nkomani	NIL Legacy Event	Virtual	Building Nutrition Capacity in Response to	Sep. 17, 2021	332

			National Priorities in Malawi		
Bernadette Chimera-Khombe	NIL Legacy Event	Virtual	Lessons Learned in Multistakeholder Nutrition Capacity Building in Malawi	Sep. 17, 2021	332
Alexander Kalimbira	NIL Legacy Event	Virtual	Sustainable Impact in Building Nutrition Capacity in Malawi: What the Future Holds	Sep. 17, 2021	332

Publications:

- Nkomani S, Ausman LM, Marino-Costello E, et al. Nutrition capacity building to meet national priorities: lessons learned in developing and implementing Malawi's first dietetics program. *Glob Health Sci Pract*. 2021;9(4):928-935. https://doi.org/10.9745/GHSP-D-20-00687

vi) Capacity Building

Long-term training

Trainee Number	Sex	University	Degree	Major	Program End Date (month/year)	Degree Granted (Y/N)	Home Country
1	M	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi
2	M	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi
3	F	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi
4	F	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi
5	F	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi
6	F	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi

7	M	LUANAR	Masters Clinical Dietetics	Clinical dietetics	September 2021	Expected Graduation May 2022	Malawi

vii) Issues and Concerns:

Discussions with LUANAR faculty and Deans around the standard approved requirements necessary for the Supervising Dietitian position which will replace Sanele Nkomani. Specifically, staff leading the master's Clinical Dietetics Program must have 3-5 years clinical dietetics experience in patient care. This standard qualification has been acknowledged by the Dean and has been included in the external consultancy report.

The Malawian Clinical Standards of the Registered Dietitian Practice document has been developed and was submitted for review to the Medical Council in the third quarter of 2020. There has been no report from the Medical Council as of this time. However, during a meeting at the Department of Nutrition, it came to our attention that another document is being written for the same Registered Dietitian Practice Guidelines, and this version is under the leadership of the Department of Nutrition, HIV and AIDs and the Food and Nutrition Bill. The DNHA Practice document will be presented to Parliament. The team learned of the duplicate documents and effort and shared their work with the DNHA Director. At this time, the Director brought both groups together to work on merging both documents to produce one set of Dietitian Practice Guidelines for Malawi which was completed.

III. Innovation Transfer and Scaling Partnerships

Unlike other Innovations Labs, which focus on generating new varieties of seeds, techniques for pest control or tools for market analyses, the Nutrition Innovation Lab's main intellectual property relates to dissemination of research findings which directly impact policy and program design and the methods of implementing both. One technology transfer which represents an important step forward in research across all the focus countries is the programming and use of electronic tablets for implementing surveys in the field. The Nutrition Lab's innovative research, technologies and novel research uptake, dissemination, policy engagement and partnerships strategies at the national, regional and global through webinars and legacy event have resulted in a continued multi-sectoral engagement to develop strong political commitment and action plans for various national, sub-national and federal governments to evaluate different policy and program options and their feasibility for successful implementation across the agriculture value chains. In addition, the ongoing pandemic meant engaging with partners through virtual teleconferences, such as Zoom conference, Microsoft meeting, Google Meet, etc.

In the final year of the Lab continued to plan for research uptake strategies and focus on extensive stakeholder engagement in focus countries through virtual disseminations and various evidence-sharing platforms (publications, articles, webinars, etc.). The Lab produced seminal papers and manuscripts across all three of its research streams and had continued to aim to continue producing manuscripts of high caliber.

The Lab focused on the way forward by compiling findings to gain an understanding future directions. In addition to the writing, the ME the launched the work in Jordan. In this last year, the Lab closed all activities, confirmed that population of all data into the database library, and finalized all written work. The final dissemination event of the Lab's work was showcased in the NIL Legacy Event, held September 16-17th, 2021. A complete list of conference presentations and recordings can be accessed here.

IV. Governance of the Nutrition Innovation Lab

The Nutrition Innovation was awarded an additional year, FY2021, to continue work which was postponed in FY2020 due to the global pandemic. Partners submitted a budget for funds that would be carried over to FY2021 and a revised workplan that outlined how previously approved activities would be . Our workplan was adjusted to allow continued work to disseminate findings from the last 10 years of research through virtual platforms given that global travel remained prohibited. The Lab has published 15 manuscripts during this fiscal year. Cost share has been met as of year 10. The team continued with data curation, analysis, and paper writing activities, processing of samples for inflammatory biomarker analysis. Our team also conducted a virtual final dissemination event in for USAID in September 2021.

V. Database Management and Curation of Data

During the reporting period, the ME continued to work on database management and curation of data. The Nutrition Lab worked with Tufts Technology Services in developing a platform for data sharing (Lab Archives). The platform hosted by Tufts University allows sharing of data across all the Nutrition Lab partner institutions. Per the DMP, data will be also released to public access on this platform. Significant amount of work is still ongoing, particularly on developing the metadata and procedures as well as coding manuals for the different studies (listed in the DMP). The work is expected to be completed by the end of FY2021. However, the 3-panel PoSHAN Community study) has been submitted to the USAID DDL and is currently under review. In FY2020, the Nutrition Lab reviewed the DMP and no changes were made.

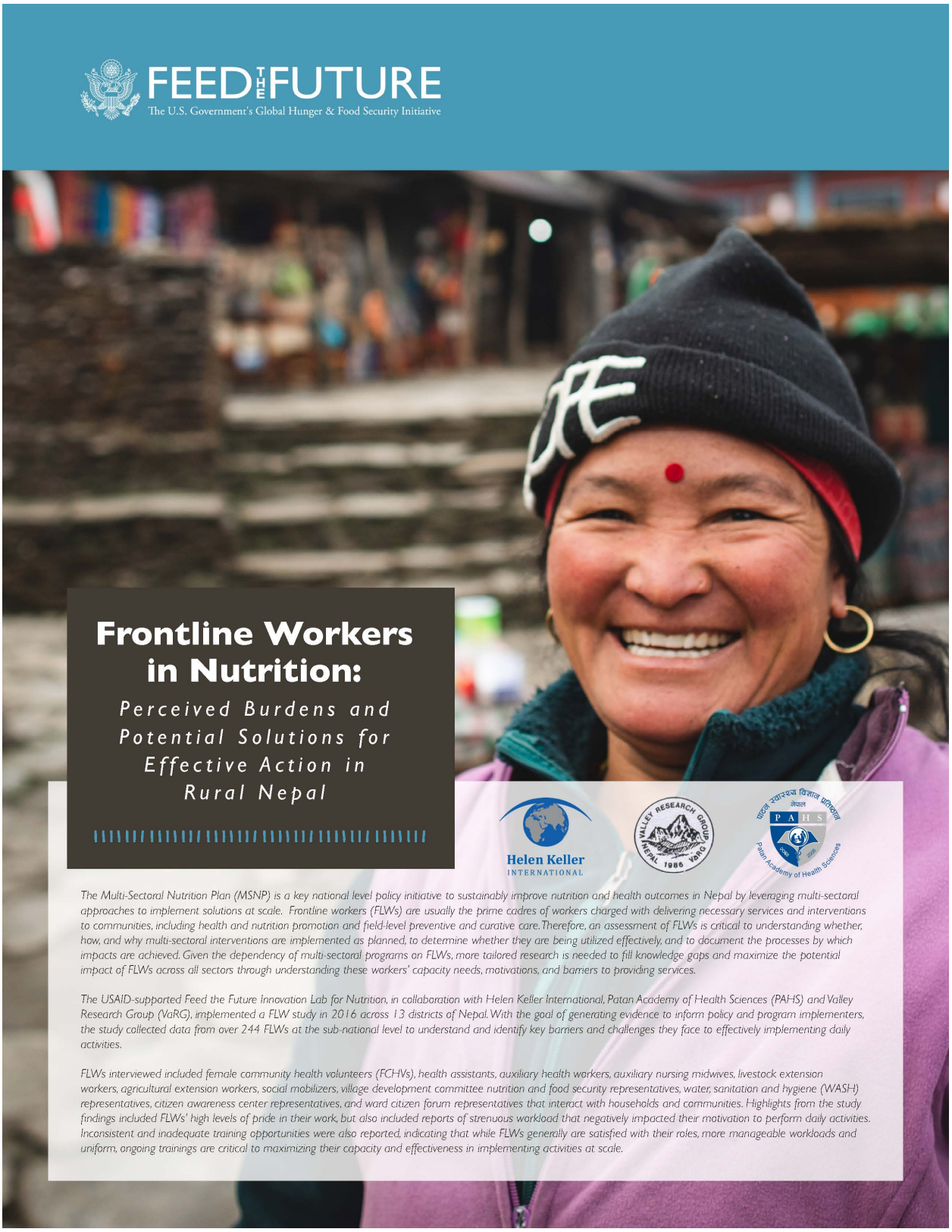
VI. EMMP – Environment Monitoring and Mitigation Plan (EMMP)

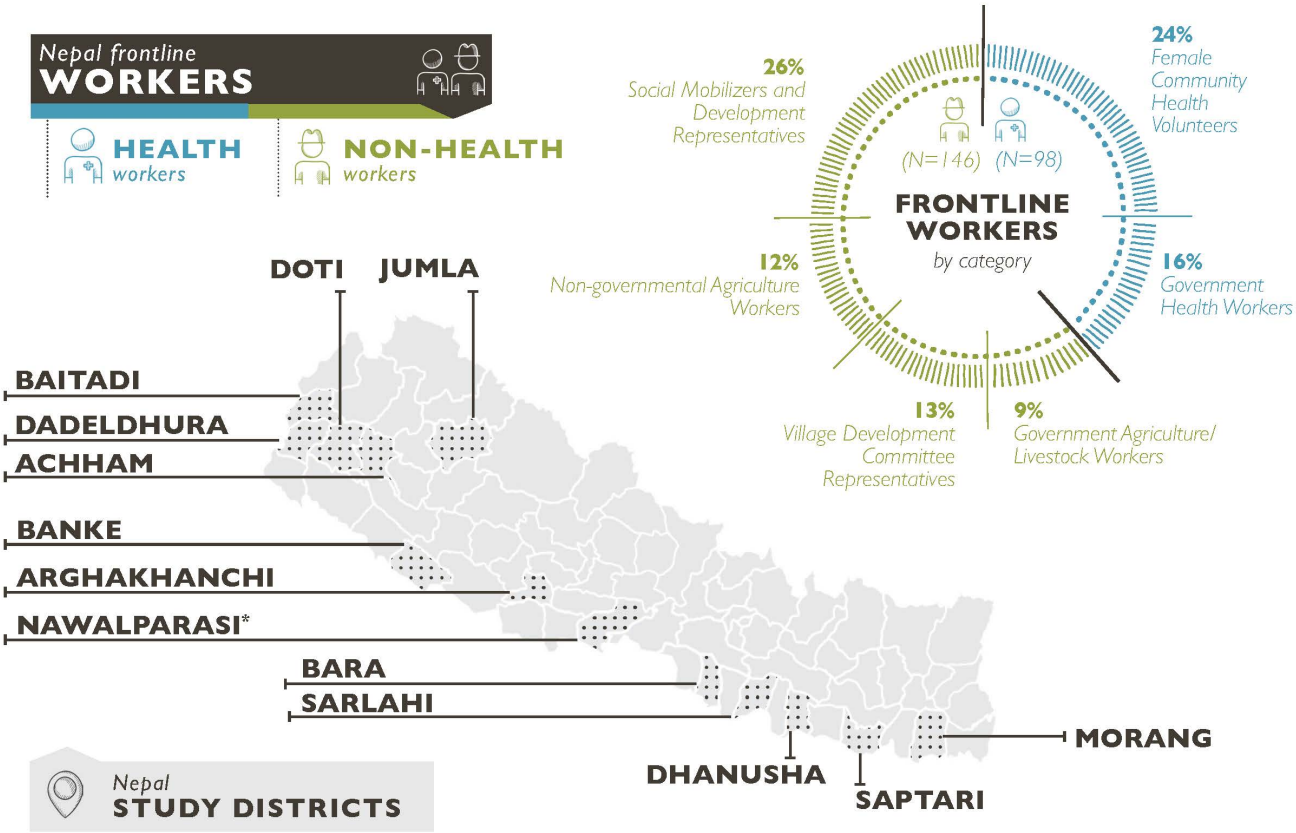
As per the USAID regulations, the ME had an approved Initial Environmental Evaluation (IEE) in place. Based on the approved IEE conditions, an Environmental Monitoring and Mitigation Plan (EMMP) was developed by the Nutrition Innovation Lab ME. An EMMP format was prepared and shared by the Tufts ME with its partners. The IEE regulations were translated into specific mitigation actions to be implemented in Nepal, Uganda and Bangladesh. Specific monitoring measures, timelines and responsible parties were identified. Institutions that report their results of the monitoring of the environmental plan of action include UC Davis Horticulture Innovation Lab (Bangladesh), Patan Academy of Health Sciences (Nepal), Makerere University (Uganda) and Nepalgunj Medical College (Nepal). The ME is responsible to review all the reports for quality assurance. A quarterly review of the EMMP monitoring and mitigation activities was conducted and information for each IEE condition was compiled by in-country study coordinators and reported to the ME.

There were no research activities to report during the reporting period. However, reports on the final updates from FY 2019-20 for all three country activities with IEE conditions is attached in Appendix 4. Also

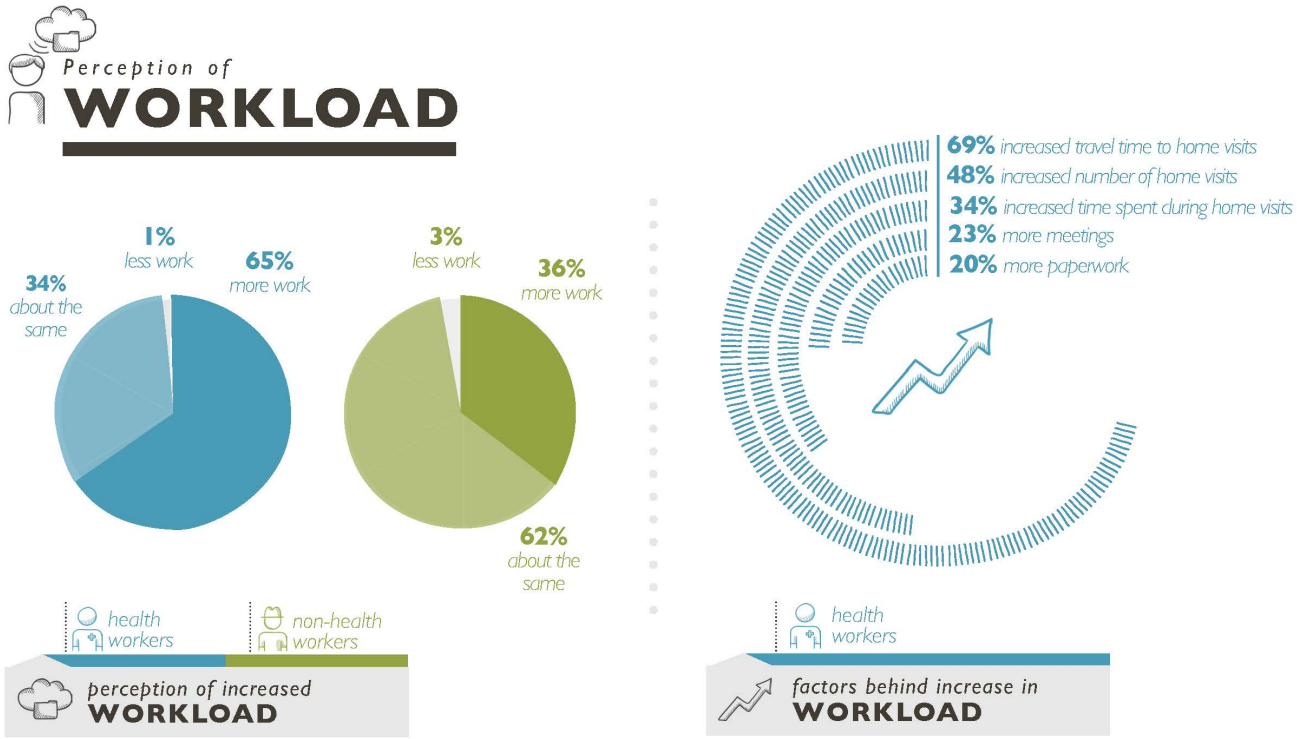
attached are manuals highlighting standard operating procedures (SOPs), monitoring reports and certificates.

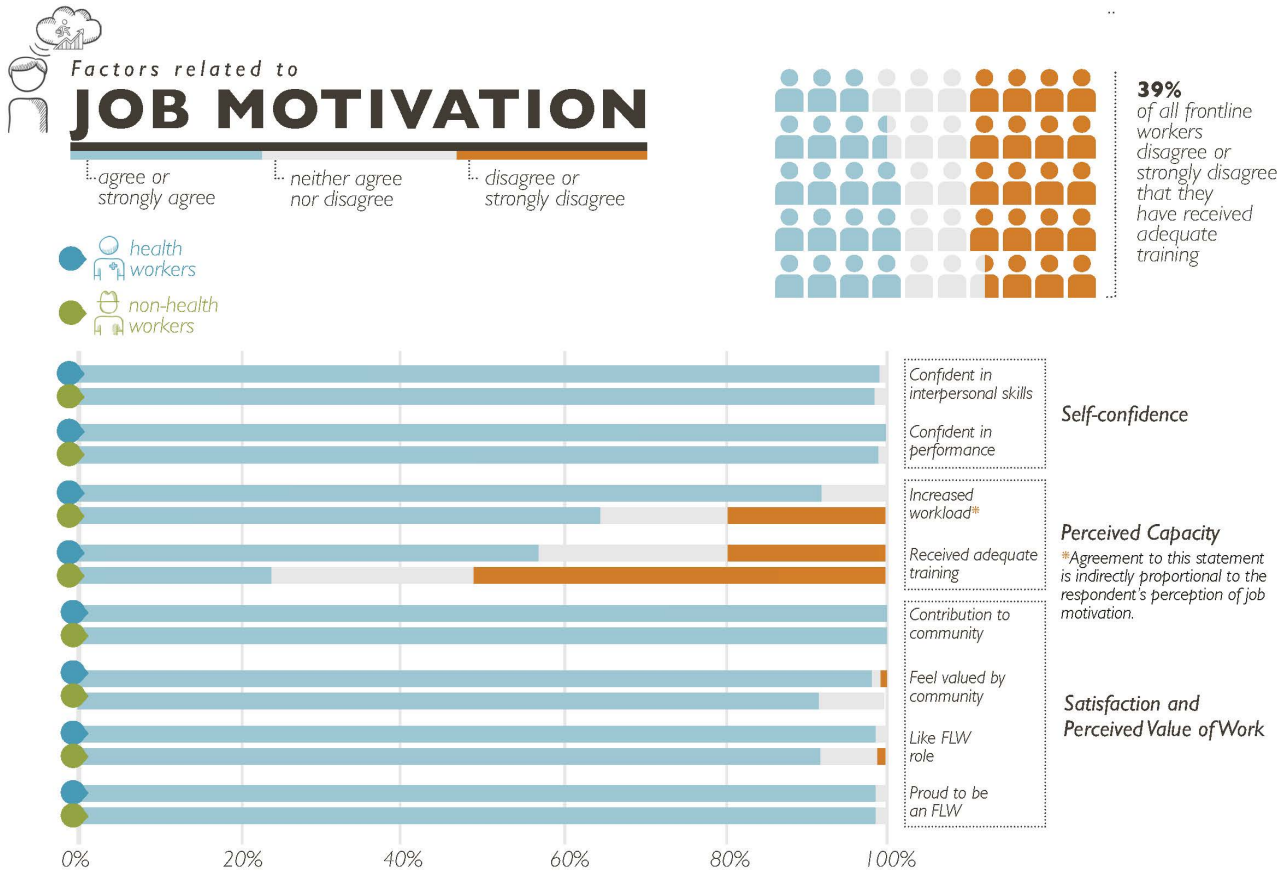
Appendix 1: Frontline Workers Study Infographic

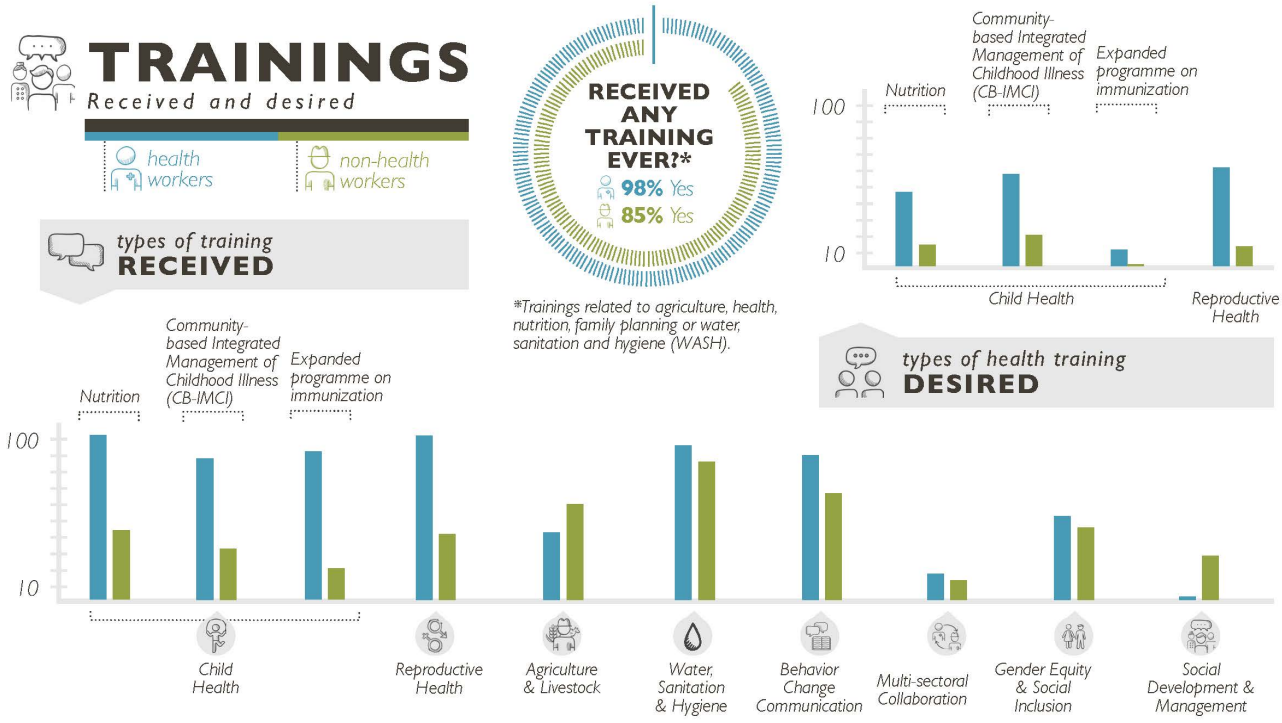




*Nawalparasi District was split into two districts Nawalpur District and Parasi District after the state's reconstruction of administrative divisions on September 20, 2015.







Frontline Workers in Nutrition: Perceived Burdens and Potential Solutions for Effective Action in Rural Nepal 03

Appendix 2: Success Story

Looking Past a Decade of Accomplishments in Nutrition: The NIL Legacy

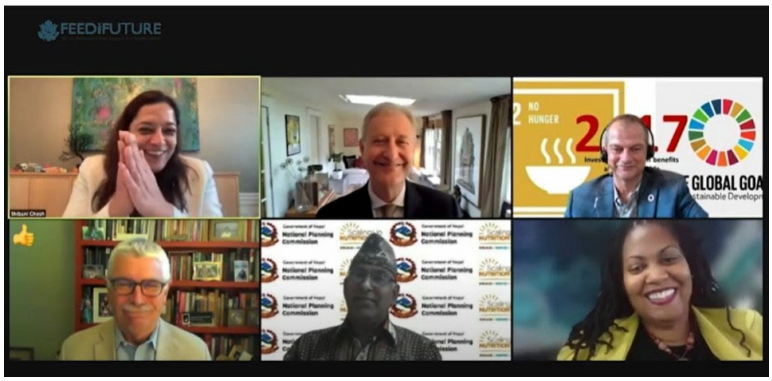
> "The Nutrition Innovation Lab really epitomizes how science can effectively be translated into practice, and that this translation into practice is best achieved through partnerships with local partners who are essential leaders and investors in their own actionable nutrition science and the use of its findings."
>
> *– Megan Rhodes, Division Chief of Nutrition Technical Services, Bureau of Resilience and Food Security, USAID | September 16, 2021*

The Nutrition Innovation Lab has spent over a decade pursuing rigorous research and building human and institutional capacity to advance nutrition in host countries in Africa and Asia, including Nepal, Uganda, Malawi, Mozambique, Bangladesh, Jordan, Tanzania, Timor Leste, Ghana, and Ethiopia. As one of its final close-out activities, the Lab hosted a two day virtual conference, "*Looking Beyond a Decade of Accomplishments in Nutrition*," on September 16-17th, 2021 to celebrate its achievements and disseminate key lessons learned to a global audience.

This event brought together over 300 development professionals, donors, thought leaders, and other stakeholders to digest and discuss accomplishments of the Nutrition Innovation Lab, highlighting opportunities and implications for ongoing and future programming and policies supporting agriculture, poverty reduction, resilience, and nutrition. The agenda featured a nexus of Nutrition Innovation Lab collaborators and country experts, as well as professionals from the US government and beyond.

During the two days, the program featured 43 speakers during 15 sessions as well as three video testimonials from Nutrition Lab long-term and short-term training participants. These sessions included country highlights from Nepal, Uganda, and Malawi, as well as thematic panel discussions featuring novel research findings, metrics, and program outcomes. Conversations between panelists centered on the nutrition policy and governance, agriculture and nutrition linkages, mycotoxins and gut inflammation, the impact of seasonality and climate change, and more.

The highlight of the 2-day event was the final session, the high-level roundtable discussion, which was opened by a video message from United States Senator Edward Markey and live remarks from United States Representative Jim McGovern. Both Congressmen praised the Nutrition Lab for its work over the decade and highlighted the importance of robust evidence generation to support continued national and international nutrition and food systems policies.



The roundtable discussion was moderated by Aysha House, Vice President of the Millennium Challenge Corporation's Congressional and Public Affairs, and featured USAID's Chief Scientist, Dr. Robert Bertram; USAID's Chief Nutritionist, Shawn Baker; the Nepal National Planning Commission Join Division Chief, Dr. Kiran Rupakhetee; and the Nutrition Innovation Lab Director and Associate Director, Drs. Patrick Webb and Shibani Ghosh. The in-depth conversation focused on best practices and lessons learned throughout the program's history for identifying priorities, engaging country partners, generating rigorous evidence, and ensuring uptake. The panelists drew apt conclusions on the importance of embracing a food systems-level approach moving forward, appropriately rounding out more than a decade's work as the Nutrition Innovation Lab and paving the way for the launch of the newest Innovation Lab, the Food Systems for Nutrition Lab.

Appendix 3: List of FY21 Presentations

Date	Presenter	Event	Location	Topic	Audience
10/7/2020	Sanele Nkomani	NIL Webinar- Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and institutional capacity for nutrition	Virtual	Malawi's First Dietetics Program: Key achievements, lessons learned and future directions	239
10/7/2020	Bernadette Chimera-Khombe	NIL Webinar- Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and institutional capacity for nutrition	Virtual	State of Nutrition in Malawi	239
10/7/2020	Lynne Ausman	NIL Webinar- Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and institutional capacity for nutrition	Virtual	Nutrition Capacity Development to Meet National Priorities	239
10/21/2020	Averalda van Graan	NIL Webinar- The Malawi Food Composition Database (MAFOODS): Importance, development process,	Virtual	Reflecting on the Development and Establishment of a Food Composition Database and System for Malawi	226

		applications, and future priorities			
10/21/2020	Stevier Kaiyatsa	NIL Webinar- The Malawi Food Composition Database (MAFOODS): Importance, development process, applications, and future priorities	Virtual	Use of the Malawi Food Composition Database (MAFOODS)	226
11/4/2020	Andrew Thorne-Lyman	NIL Webinar- Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia: The Intersection of Agriculture, Nutrition, and Health	Virtual	Seasonality of the Child Dietary Diversity Indicator in Nepal, Peru, and Senegal	321
11/4/2020	Elena Broaddus	NIL Webinar- Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia: The Intersection of Agriculture, Nutrition, and Health	Virtual	Young Children's Consumption of Non-Staple Micronutrient-Rich Foods in Nepal: Seasonality and Associations with Small-Scale Livestock Production	321
11/4/2020	Isabel Madzorera	NIL Webinar- Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia	Virtual	Diet Quality for Women in Tanzania and its Determinants	321

11/4/2020	Wafaie Fawzi	NIL Webinar-Assessing Predictors and Metrics of Diet Quality in Sub-Saharan Africa and South Asia	Virtual	Session moderator	321
11/18/2020	Will Masters	NIL Webinar-Measuring Resilience: An Approach Using Data from Nepal, Bangladesh, and Uganda	Virtual	What is resilience?	369
11/18/2020	Sonia Zaharia	NIL Webinar-Measuring Resilience: An Approach Using Data from Nepal, Bangladesh, and Uganda	Virtual	A method to measure resilience	369
2/3/2021	Shibani Ghosh	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	The Association Between Animal Sourced Food Consumption and Metrics of Child Growth and Development	556
2/3/2021	Andrew Thorne-Lyman	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	Why Child Development Within Nutrition Innovation Lab Research	556
2/3/2021	Laurie Miller	NIL Webinar-The Role of Diet in Early Child Development: Evidence from Nepal	Virtual	Dietary Quality over Time is Associated with Better Development in Young Rural Nepali Children	556
2/3/2021	Merina Shrestha	NIL Webinar-The Role of Diet in Early Child Development:	Virtual	Ages and Stages Questionnaire 3rd Edition	556

		Evidence from Nepal			
2/19/2021	Isabel Madzorera	GLOBAL FOOD+ 2021 Webinar	Virtual	Food Systems and Distance to Markets Influence Diet Quality for Women: Evidence from Tanzania	Unknown
3/3/2021	Eileen Kennedy	NIL Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Virtual	Nutrition Policy and Governance in Ethiopia: What Difference Does Five Years Make?	308
3/3/2021	Grace Namirembe	NIL Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Virtual	Development of a Novel Metric: The Nutrition Governance Index (NGI)	308
3/3/2021	Shibani Ghosh	NIL Webinar: Effective Governance for Nutrition Programming: Lessons from Ethiopia and Nepal	Virtual	Effective Governance for Nutrition Programs: the POSHAN Policy Process Studies	308
3/24/2021	Patrick Webb	Keynote webinar for USAID's Africa-focused Global Learning Experience Exchange (GLEE)	Virtual	What evidence can we rely on for multisector programming for nutrition?	550
3/24/2021	Shibani Ghosh	Keynote for USAID's Asia-focused Global Learning Experience Exchange (GLEE)	Virtual	Multi-sectoral Nutrition: Evidence for action	550

4/1/2021	Shibani Ghosh	U.S.G. Global Nutrition Coordination Plan Webinar	Virtual	Mycotoxin Exposure and Nutritional Status in the First 1000 Days	Unknown
4/7/2021	Swetha Manohar	NIL Webinar-Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Supporting Capacity Building in Nepal: A Review of the Nutrition Innovation Lab's Activities Between 2012-2019	215
4/7/2021	Kedar Baral	NIL Webinar-Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Institutional Capacity Building in Nutrition Education and Research: Perspectives from PAHS and Nepal	215
4/7/2021	Ram Shrestha	NIL Webinar-Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Capacity Building in Nepal: Experiences and Suggestions	215
4/7/2021	Bernard Bashaasha & Edgar Agaba	NIL Webinar-Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Building Capacity in Uganda: Supporting Ugandan Students and Professionals in Nutrition-Agriculture Research for Development	215
4/7/2021	Rebecca Kuriyan Raj	NIL Webinar-Sustainable Development of Institutional and Human Research Capacity for Nutrition	Virtual	Bangalore Boston Nutrition Collaborative (BBNC)	215

4/28/2021	Christopher Duggan	NIL Webinar-Mycotoxins, Environmental Enteric Dysfunction, and Inflammation: Implications for Research and Programming on Child Growth and Nutrition	Virtual	Mycotoxins, EED, and Inflammation	256
4/28/2021	Shibani Ghosh	NIL Webinar-Mycotoxins, Environmental Enteric Dysfunction, and Inflammation: Implications for Research and Programming on Child Growth and Nutrition	Virtual	Mycotoxins, the Microbiome and Environmental Enteric Dysfunction	256
4/28/2021	Patrick Webb	NIL Webinar-Mycotoxins, Environmental Enteric Dysfunction, and Inflammation: Implications for Research and Programming on Child Growth and Nutrition	Virtual	Mycotoxins, EED and Inflammation: Implications for Programming	256
5/12/2021	Laurie Miller	NIL Webinar-Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal,	Virtual	Multisectoral Community Development in Rural Nepal	377

		Bangladesh, and Uganda			
5/12/2021	Neena Joshi	NIL Webinar: Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda	Virtual	Multisectoral Community Development in Rural Nepal	377
5/12/2021	Nassul Kabunga	NIL Webinar- Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal, Bangladesh, and Uganda	Virtual	Evaluation of the USAID Community Connector Program in Uganda	377
5/12/2021	Katie Appel	NIL Webinar- Effectiveness of Multisectoral Programming to Improve Nutrition-Sensitive Agriculture, Nutrition, and Health: Experiences from Nepal,	Virtual	Implications of Aquaculture and Horticulture Engagement in Bangladesh	377

		Bangladesh, and Uganda			
5/19/2021	Lynne Ausman	NIL Webinar- The Role of Micronutrients in Child Growth and Development	Virtual	Iron and Vitamin A Levels in Pregnant Women and Birth Outcomes: Results from a Birth Cohort Study in Uganda	638
5/19/2021	Andrew Thorne-Lyman	NIL Webinar- The Role of Micronutrients in Child Growth and Development	Virtual	Lifecycle Connections in Our Micronutrient Related Research in Nepal	638
5/24/2021	Shibani Ghosh	Feed the Future Ethiopia: Growth through Nutrition Webinar	Virtual	The Role of Animal Source Foods in Nutrition Security, Growth, and Early Child Development	60
5/26/2021	Sofia Costa	NIL Webinar- Avaliação da Relação entre a Exposição à Aflatoxina e a Desnutrição Crónica em Crianças de 6-59 Meses de Idade em 10 Distritos na Província de Nampula em Moçambique	Virtual	Avaliação da Relação entre a Exposição à Aflatoxina e a Desnutrição Crónica em Crianças de 6-59 Meses de Idade em 10 Distritos na Província de Nampula em Moçambique	45
6/9/2021	Rumana Akter	NIL Webinar- Innovative Metrics of Diet Quality in Low- and Middle-Income Settings	Virtual	Assessing Diet Quality Using Different Metrics	323

6/9/2021	Isabel Madzorera	NIL Webinar- Innovative Metrics of Diet Quality in Low- and Middle-Income Settings	Virtual	Innovative Metrics for Measuring Diet Quality for Women in Low and Middle-Income Countries	323
6/9/2021	Will Masters	NIL Webinar- Innovative Metrics of Diet Quality in Low- and Middle-Income Settings	Virtual	Diet quality measurement to measure food cost & affordability and guide food system actions	323
6/10/21	Sofia Costa and Katie Appel	NIL Webinar- The Relationship Between Aflatoxin Exposure and Chronic Malnutrition in Nampula Province, Mozambique	Virtual	The Relationship Between Aflatoxin Exposure and Chronic Malnutrition in Nampula Province, Mozambique	124
9/16/21	Lynne M. Ausman	3rd All Africa Postharvest Congress and Exhibition	Virtual	Maternal aflatoxin exposure decreases infant weight and WAZ at birth whereas exposure from breastmilk was not associated with growth impairment from 3 to 6 months in exclusively breastfed infants	Unknown
9/16/2021	Patrick Webb	NIL Legacy Event	Virtual	Back to the Future: Lessons from a Decade of the Nutrition Innovation Lab	332
9/16/2021	Andrew Thorne-Lyman	NIL Legacy Event	Virtual	Insights into the Seasonality of Diets and Food Systems from the PoSHAN Community Studies in Nepal	332
9/16/2021	Gerald Shively	NIL Legacy Event	Virtual	Understanding the role of isolation in nutritional	332

				risk: past, present, and future	
9/16/2021	Will Masters	NIL Legacy Event	Virtual	Climate shocks and child growth: What have we learned about when and how to intervene?	332
9/16/2021	Isabel Madzorera	NIL Legacy Event	Virtual	Women's Diet Quality: Measurement, Role of Food Systems and Implications for Child Health Outcomes	332
9/16/2021	Neena Joshi	NIL Legacy Event	Virtual	Agriculture Nutrition Linkages- Heifer Nepal Experiences	332
9/16/2021	Nassul Kabunga	NIL Legacy Event	Virtual	Evaluating Large-scale Multisectoral Ag-Nutrition Initiative	332
9/16/2021	Sonia Zaharia	NIL Legacy Event	Virtual	The Empirical Benefits of Longitudinal Data in Nutrition	332
9/16/2021	Rebecca Kuriyan Raj	NIL Legacy Event	Virtual	Building Sustainable Human Capacity in Asia and Africa: Bangalore Boston Nutrition Collaborative (BBNC)	332
9/16/2021	Bernard Bashaasha and Edgar Agaba	NIL Legacy Event	Virtual	Towards Inclusive Human and Institutional Capacity Development for Nutrition in Uganda	332
9/16/2021	Margaret Kabahenda	NIL Legacy Event	Virtual	Capacity Building for Extension Agents as Community Nutrition Educators	332
9/16/2021	Eileen Kennedy	NIL Legacy Event	Virtual	Nutrition Policy and Governance in Ethiopia: What Difference Does 5 Years Make?	332

9/16/2021	Rolf Klemm	NIL Legacy Event	Virtual	Key Lessons Learned on the Design and Implementation of Multisector Programs for Nutrition in Nepal	332
9/16/2021	Patrick Webb	NIL Legacy Event	Virtual	Measuring the 'Quality' of Policy Implementation: A Nutrition Governance Index Tested in Nepal	332
9/17/2021	Swetha Manohar	NIL Legacy Event	Virtual	Intended and Unintended Successes of the Nutrition Innovation Lab's Research Capacity Building Initiatives in Nepal	332
9/17/2021	Kedar Baral	NIL Legacy Event	Virtual	Institutional Capacity Building in Nutrition Education and Research: Perspectives from PAHS and Nepal	332
9/17/2021	Ram Shrestha	NIL Legacy Event	Virtual	Beyond Workshops and Symposia: Impact of N-IL in Strengthening a Strong Foundation of Young Nepali Nutrition Professionals	332
9/17/2021	Jacqueline Lauer	NIL Legacy Event	Virtual	Environmental Enteric Dysfunction and Undernutrition: New Insights and Ongoing Challenges	332
9/17/2021	Akriti Singh	NIL Legacy Event	Virtual	Emerging Biomarkers of Environmental Enteric Dysfunction (EED)	332
9/27/2021	Johanna Andrews-Trevino	NIL Legacy Event	Virtual	Exposure to Multiple Mycotoxins, Environmental Enteric Dysfunction and Child Growth in Banke, Nepal	332

9/17/2021	Saiful Islam	NIL Legacy Event	Virtual	Unpacking the Determinants of Food Safety and Quality Concern Dynamics: Evidence Using Panel Data from Rural Bangladesh	332
9/17/2021	Giacomo Zanello	NIL Legacy Event	Virtual	Use of Accelerometer Devices to Capture Energy Expenditure in Agricultural and Rural Livelihoods	332
9/17/2021	Will Masters	NIL Legacy Event	Virtual	Food Prices: How Value Chains, Policies and Programs Affect the Affordability of a Healthy Diet	332
9/17/2021	Saurabh Mehta	NIL Legacy Event	Virtual	Measurement of Nutrition and Food Safety Biomarkers at the Point-of-Need	332
9/17/2021	Sanele Nkomani	NIL Legacy Event	Virtual	Building Nutrition Capacity in Response to National Priorities in Malawi	332
9/17/2021	Bernadette Chimera-Khombe	NIL Legacy Event	Virtual	Lessons Learned in Multistakeholder Nutrition Capacity Building in Malawi	332
9/17/2021	Alexander Kalimbira	NIL Legacy Event	Virtual	Sustainable Impact in Building Nutrition Capacity in Malawi: What the Future Holds	332
9/17/2021	Patrick Webb, Shibani Ghosh, Rep. Jim McGovern, Aysha	NIL Legacy Event	Virtual	Panel Discussion: Looking Beyond a Decade of Accomplishments in Nutrition	332

	House, Shawn Baker, Kiran Rupakhetee				
10/7/2021	Shibani Ghosh	Updating the Global Food Security Research Strategy: New Evidence and Opportunities	Virtual	Diet Quality, Nutrition, and Inclusion	100

Appendix 4: Environmental Monitoring and Mitigation Plan (EMMP)

Bureau/Office: Bureau for Food Security/Agricultural Research and Policy

Program/Activity Title: Feed the Future Innovation Lab for Nutrition (Tufts University) (Nutrition Innovation Lab)

Functional objective 4: Economic Growth

Program Area: 4.5 Agriculture
4.5.2 Agricultural

Program Elements: Sector Productivity

IEE Expires: September 30, 2020

Last updated: August 17, 2018

IEE activity 2: Pilot-testing selected small-scale food security technologies - Bangladesh					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
1. Technologies selected for pilot testing must be appropriate to local environmental conditions and integrate sector-specific best management practices (BMPs) such as those enumerated in the USAID Sector Environmental Guidelines and/or comparable resources	1a. Provide instructions on proper construction and use of the solar dryer, CoolBot rooms, and floating gardens.	1a. Identify locations where solar dryers, CoolBot rooms, and floating gardens will be used.	1a. Make sure the SOP for use and disposal are in place and shared with those using the solar dryers. List responsible parties to do this (e.g., Nil Director, Associate director, or Local country coordinator or US PI. Etc., and USAID AOR when feasible), same for every cell in this column	4.1.2018 8.1.2018	On the month of January, one chimney dryer was repaired in Parerhat to improve fish drying. All torn plastic and non-biodegradable materials were replaced in a given jute sack for recycling. The sacks were not full yet at any of the locations. The record keeping continued during the standard monthly technology checklist monitoring plan.
	1b. Check solar dryer plastic after each use and repair holes/tears with tape or a sealant.	1b. Keep inventory of solar dryer plastic covers and plastic containers provided to each community and those collected for recycling, and how they were disposed of.	1b. Site visits and reporting will be performed twice a year and when contacted by the community to pick up the full sack.	4.1.2018 8.1.2018 21.1.2018 **14.** 1.2018, 4.2.2018 **15.** 2.2018, 1.3.2018	After chimney dryer repair in January, drying process has been monitored and checked. Dryers, floating gardens and cold rooms were monitored twice in a month or as needed. Two new plastic containers were added in one floating gardens at Agoiljhara to maintain floating balance, old one kept in the given just sack. The jute sack was not full at any of the locations yet. The record keeping is continuing during the standard monthly technology checklist monitoring plan.

	1c. Plastic unsuitable for further use shall be reused by community members or placed in provided sacks for collection for appropriate recycling or disposal.		Responsible Party: Amrita Mukherjee	4.1.2018 8.1.2018 21.1.2018 15.2.2018 8.3.2018	One chimney dryer has been repaired in Parerhat, Pirojpur for Fish drying. Two pieces of plastic have been unused and placed in the given jute sack for recycling. The sacks were not full yet at any of the locations. The record keeping is continuing during the standard monthly technology checklist monitoring plan.
	1d. Plastic jars provided for storage of dried products will be recycled by project staff when no longer useable. They will be placed in provided sacks awaiting collection.			21.1.2018 15.2.2018 21.3.2018	Plastic jars are still in use, no record of damage found yet. Record keeping is continued as part of the monthly technology checklist monitoring plan.
	1e. The sack provided for unusable plastic collection will contain the contact information of project staff to arrange for pickup.			4.1.2018 8.1.2018 21.1.2018 14.1.2018 4.2.2018 15.2.2018 1.3.2018	Since winter was the time for drying more monitoring has been done about technology and farmers preparation. Given sack are equipped with contact info of the project staff for all three technologies (Amrita Mukherjee and Mohammed Rezaul Islam)
	1f. The plastic containers used to float the gardens are second hand 30 L containers that were used to store acetic acid (vinegar). Acetic acid poses no threats to humans or fishes/animals. The containers will be reused if possible after the floating gardens are dismantled or			14.1.2018 4.2.2018 1.3.2018	Since pond water quality and toxicity levels tested on the month of May 2017 and no effect found on pond water quality and toxicity levels on fish. Another water quality testing will be done on May,2018. But during farmers group discussion observation on water quality has been recorded and no negative feedback were found. No new repairing or replacing of plastic containers has been done after February,2018

	disposed of by the project staff if they are unusable.				
2. Worker health and safety must be addressed in the assessment of candidate technologies, including the use of personal protective equipment (PPE). Specific worker health and safety requirements must be established as one set of criteria for any subsequent scale-out of selected technologies.	2. We do not have plans to use synthetic pesticides in this project and participating farmers will be instructed not to use pesticides near the fishponds. Natural plant extracts, such as Neem, may be used when needed. Farmer training will include some IPM strategies for pest management, including biological and mechanical approaches. For example, farmers may be provided with plastic for solarization of floating gardens and pest exclusion nets to place over the top of the beds.	2. Verify proper use of IPM techniques for pest control by interviewing farmers and inspecting floating gardens during site visits at least two times per year.	2. Site visits twice per year. Responsible Party: Amrita Mukherjee (Bangladesh), Angelos Deltsidis (UC Davis) and cognizant USAID AOR/AM.	Please report on site visit findings on proper use of IPM techniques	The team has introduced mechanical pest control measures, rat traps, soil solarization and netting for floating gardens. The team noted that these activities sometimes require labor need technical expertise. Neem extract is being used for pest infestation which sometimes works relatively slowly and is less effective in case of massive infestation compared to field cultivation practices which involve chemical fertilizers and pesticides. However, farmers have shared that vegetables grown in floating gardens had more taste and flavor compared to field grown ones and they feel safe to in case of feeding their children and household consumption.

IEE activity 3: Scale out of selected technologies - Bangladesh					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
1. Financial support, either direct (e.g., via a grant-making mechanism or similar) or indirect (e.g., such as through a loan guarantee program or similar) to entrepreneurs, marketers, or other partners engaged in the scale out of successful technologies is disallowed until such time that an IEEE amendment that fully addresses the nature and scope of anticipated activities is prepared and duly approved.	1a. Financial support will not be provided to farmers or communities; however, the technologies will be provided to the communities for their use.	1a. Develop protocols and agreements in collaboration with each community to guide common use of the shared cool room.	1. Responsible Party: Amrita Mukherjee (Bangladesh), Angelos Deltsidis (UC Davis) and cognizant USAID AOR/AM	23.5.2016 for Lebukhali. Patuakhlai Cool room, 2.8.2017 for Madhukhali, Faridpur cool room, 23.11.2016 for Kalapara, Patuakahli cool room.	UC Davis has a written agreement with owner farmers for rent-free usage and common sharing of cold room. The agreement was done for two years.
	1b. For the CoolBot cool rooms, the community leader will collect a rental fee for use of the cool room that will used to maintain the room when the project support ends. This will promote the sustainability of the technology once the project ends.	1b. Visit technology sites at least two times per year and interview community about use of technology and any issues.			During trainings, field days and regular site visits project personnel set aside time for discussion, questions and sharing issues, local recommendations and success about technologies. For instance, Coolbot communities are seeking a way to manage cool room running cost during the lean season, the team has considered the issue and has started working on in a business model which might cover the electricity and maintenance cost during the lean season and even after the project.

2. Any technical assistance and capacity building to promote the scale out of successful small-scale approaches must incorporate and emphasize the respective environmental BMPs identified and implemented through the pilot testing phase.	2. Technical manuals and all presentations about the technologies will include environmental BMPs identified and implemented through the pilot testing phase.	2. Manuals and presentations will be archived by the Horticulture Innovation Lab.	2. Responsible Party: Amrita Mukherjee (Bangladesh), Angelos Deltsidis (UC Davis) and cognizant USAID AOR/AM	28.2.2016, 5.3.2016 and 24.4.2016 (chimney dryer, Coolbot, and Floating gardens	Developed manuals are stored at the Horticulture Innovation Lab, UC Davis cloud storage system (www.box.com)
3. Partners engaged in scale out efforts must receive a presentation or basic orientation on the environmentally sound design and management of Nutrition Innovation Lab-Asia-supported activities, including the promotion and proliferation of selected small-scale food security technologies. This presentation/orientation process will also identify needs for technical training and capacity building such that partners can competently train or advise smallholder farmers on the use/implementation of such technologies in a manner that is consistent with the methods, recommendations, and/or findings generated through the pilot testing phase.	3a. Presentations will be prepared and provided/presented to the Technical Advisory Group, partner universities and USAID Mission for sharing with partners engaged in scale-out activities.	3a. Copies of presentations will be maintained at the Horticulture Innovation Lab.	3. Responsible Party: Amrita Mukherjee (Bangladesh), Angelos Deltsidis (UC Davis) and cognizant USAID AOR/AM.	19.11.2017	A presentation has been presented at the USAID mission and stored at the UC Davis cloud storage system (www.box.com)
	3b. All parties will be invited to field days to view the technology in use and learn more about its construction and use.	3b. A list of all field days and the attendees will be maintained by the Horticulture Innovation Lab.		06.05.2017	Data has been maintained by Horticulture Innovation Lab staff. Last field day on floating garden was in Chandrahar, Gournadi with 13 males and 3 females present.

4. The Nutrition Innovation Lab-Asia must prepare and make available for use by partners a technical manual or similar reference resource to accompany each of the technologies selected/promoted for scale out. The manual or reference resource will emphasize the importance of environmental BMPs and the means by which they are integrated or used for each technology. The manual or reference resource will be made available in local language and will rely on illustrations or other visual elements to promote understanding and adoption among marketers, as well as smallholder farmers and other beneficiaries.	4. Technical manuals emphasizing environmental BMPs and the means by which they are integrated into or used for each technology will be prepared translated, and disseminated to communities adopting the technologies, university partners, Technical Advisory Group, and other USAID implementing partners. Manuals will use appropriate illustrations and images to promote understanding and adoption by target stakeholders	4. Manuals will be archived by the Horticulture Innovation Lab for monitoring purposes, and the numbers of manuals disseminated, and recipient details will be summarized.	4. Responsible Party: UC Davis staff in California (A. Deltsidis) and Bangladesh staff (A. Mukherjee).		Manuals have been archived. Three manuals on each technology have been developed. Also, three flip charts and three leaflets have been developed and disseminated.
5. Any technology-specific PPE requirements that are established through the pilot testing phase must be treated as a required element of subsequent scale-out activities.	5. Any PPE requirements identified in the pilot testing phase will be emphasized in technical manuals and presentations about use of the technology in scaling activities.	5. Manuals will be archived for monitoring purposes, and numbers of manuals disseminated, and recipient details will be summarized.	5. Responsible Party: Amrita Mukherjee (Bangladesh), Angelos Deltsidis (UC Davis) and cognizant USAID AOR/AM.	Please report on site visit findings on proper use of IPM technique	Manuals have been archived. 36 floating garden manuals, 24 chimney dryer manuals, and 24 cold room manuals had been disseminated among the technology beneficiaries. Besides. One chimney dryer manual has been given to BAU. A copy of each manual also provided to Tufts University team.

IEE activity 4: Aflatoxin and Other Mycotoxin Assessment - Uganda					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
Clear safety standards and practices/protocols will be established for proper blood sample collection and handling practices and followed throughout the duration of the study.	Field: Each study involving aflatoxin or mycotoxin measurement will have a standard operating manual for blood collection and handling in the field	Field: Training and testing staff involved in blood sample collection and processing and disposal of needles and other materials used for blood collection. Site visits and checks by research managers and study team members	Responsible Party: Annet Kawuma and Florence Kinyata-Makerere University	N/A	Data and Specimen collection completed in June 2015.
	Lab: All Assessments being conducted will have a standard operating procedure. Strict quality assurance procedures will be established. The lab will adhere to standard biohazard protocols for lab safety as prescribed by their parent institution.	Lab: Quality assurance testing is routinely conducted by the Labs of Dr. Wang. Adherence to biohazard protocols. Training and testing of staff involved in handling and analyzing samples	Responsible Party: Aflatoxin Assessment for Nepal and Uganda: Dr. Jia Sheng Wang (UGA), Nutrition Innovation Lab partner.	Lab safety and biohazard training dates (based on the most recent certificates issued by Tufts University following the completion annual training): August 8, 2017; Monitoring visit dates: June 2017, September 2017 (attached). University of Georgia Lab: Quality assurance and lab safety inspection (research compliance) date: 12/07/2017, Training and testing of staffs: 1) Blood borne pathogens training: 01/16/2018 (updated), Biohazard waste handling: 9/6/2017, RTK Global Harmonized System training: 9/6/2017	Finding 1: The serum samples are further being processed at Tufts University lab after being shipped to the US in March 2017. Drs. Lynne Ausman and Robin Shrestha are overseeing all lab activities. A total of 5 lab technician were hired and trained to perform the sample aliquots. Before working in the lab, all staffs underwent biohazard and lab safety trainings provided by Tufts University's Environmental Health and Safety Department. The staffs were then trained by Drs Ausman and Shrestha on sample processing protocol. Each staff was provided with SOP manual. The monitoring visits are being performed every three month and a progress report was submitted to the PI and the research team. Finding 2: Lab safety inspection: IBC protocol is up to date, lab specific biosafety plan available, passed biohazard waste disposal inspection, Appropriate PPE is worn during lab activities, passed chemical and radiation safety checklist

IEE activity 5: Assessment of Aflatoxin Mitigation Intervention - Uganda					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
Clear safety standards and practices/protocols will be established for proper blood sample collection and handling practices and followed throughout the duration of the study.	Field: Each study involving collection of blood samples will have a standard operating manual for blood collection and handling in the field	Field: Training and testing staff involved in blood sample collection and processing and disposal of needles and other materials. Site visits and checks by research managers and study team members	Responsible Party: Nutrition Innovation Lab partner (Uganda) and cognizant USAID AOR/AM	N/A since data collection completed in June 2015. A total of 32 staffs were trained in blood sample collection in 2014.	Data and Specimen collection completed in June 2015.

IEE activity 6: Environmental Enteropathy Assessment - Uganda					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training(s) and other relevant dates	Major findings of site visit
1. The Nutrition Innovation Lab will ensure that clear safety standards and practices/protocols are established for proper blood and urine sample collection and handling practices are followed throughout the duration of the study.	Field: A standard operating manual for blood and urine collection and handling in the field	Field: Training and testing staff involved in blood and urine sample collection and processing. Site visits and checks by research managers and study team members	Set up of standard operating procedures at the start of the study with monitoring throughout. Uganda: Jacqueline Lauer and cognizant USAID AOR/AM	Study #1: L:M tests on children 12-16 months in Southwestern Uganda: Training for this study was conducted April 710, 2016 in Mbarara, Uganda. A refresher training was conducted June 24-15, 2016 in Mbarara, Uganda. I (Jackie) made a trip to the Southwest every two weeks for monitoring purposes. An external reviewer (Ugandan physician) also visited the sites for monitoring purposes.	Fourteen enumerators were trained (6 male, 8 female). All monitoring activities showed that SOP was followed throughout the study.

IEE activity 7: Gut Microbiome Assessment - Uganda					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training(s) and other relevant dates	Major findings of site visit
The Nutrition Innovation Lab will ensure that clear safety standards and practices/protocols are established for proper stool (human and livestock) sample collection, handling, and disposal practices and followed throughout the duration of the study.	Field: A standard operating manual for fecal sample collection and handling in the field	Field: Training and testing staff involved in fecal sample collection and processing. Site visits and checks by research managers and study team members	Set up of standard operating procedures at the start of the study with monitoring throughout. Responsible Party: Uganda: Annet Kawuma and Florence Kinyata and cognizant USAID AOR/AM, Egypt: Marwa Moaz and cognizant USAID AOR/AM	Fecal Samples were not collected	N/A
Clear analytical protocols and lab quality assurance protocols will be put in place to ensure appropriate handling of waste material generated from the analyses of the fecal DNA.	Lab: All Assessments being conducted will have a standard operating procedure. Strict quality assurance procedures will be established. The lab will adhere to standard biohazard protocols for lab safety as prescribed by their parent institution.	Lab: Quality assurance testing is routinely conducted. Adherence to bio-hazard protocols. Training and testing of staff involved in handling and analyzing samples	Responsible Party: Uganda and Egypt: Nutrition Innovation Lab partner and Cognizant USAID AOR/AM	Since samples were not collected, no analyses were performed	N/A

IEE activity 8: Water quality Assessment - Uganda					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
The Nutrition Innovation Lab will ensure that clear safety standards and practices/protocols are established for proper handling and disposal of contaminated water supplies and followed throughout the duration of the study.	Field: A standard operating manual for water sample collection and disposal. Decontamination with chlorine tablets and disposal similar to other plastic bags or taken to the health center	Field: Training and testing staff involved in water sample collection and testing. Site visits and checks by research managers and study team members	Set up of standard operating procedures at the start of the study with monitoring throughout. Responsible Party: Uganda: Annet Kawuma and Florence Kinyata and cognizant USAID AOR/AM, Egypt: Marwa Moaz and cognizant USAID AOR/AM	Training and assessment of staffs/enumerators were done in August 2014 for a period of 3 weeks and 1 week for pretest. Water sample collection was completed in June 2015. All enumerators were provided with SOP manual and implementation manual to guide them during the field data collection. Monitoring visits were made by Field supervisors (weekly) and research managers (monthly) and a progress note was submitted to the study PIs and the research team	N/A

IEE activity 9: Assessment of Malaria Prevalence in Households Benefitting from Malaria and Livestock Intervention - Uganda Birth Cohort Study					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
The Nutrition Innovation Lab will ensure that clear safety standards and practices/protocols are established and followed throughout the study for handling of blood samples and disposal of the rapid diagnostic kits used to detect malaria.	Field: A standard operating manual for using the rapid diagnostic kits and handling lancets	Field: Training and testing staff involved in using the rapid diagnostic kits and handling lancets and disposal of contaminated /used materials. Site visits and checks by research managers and study team members	Responsible Party: Uganda: Annet and Florence and cognizant USAID AOR/AM,	The staffs were trained in rapid diagnostic kits and handling lancets in August 2014. Monthly monitoring visits were made by research coordinators and progress reports were submitted until June, 2015	Training manuals included manual for using rapid diagnostic kits and its disposal. An implementation manual was prepared and distributed to all field enumerators. A local physician was hired for a week to train use of diagnostic kits and lancets disposal in 2014. Research coordinators used implementation manual as a checklist to monitor enumerators use of diagnostic tests in the field. A progress report was sent by enumerators every month.

IEE activity 9: Assessment of Malaria Prevalence in Households Benefitting from Malaria and Livestock Intervention - Uganda Panel Study					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
The Nutrition Innovation Lab will ensure that clear safety standards and practices/protocols are established and followed throughout the study for handling of blood samples and disposal of the rapid diagnostic kits used to detect malaria.	Field: A standard operating manual for using the rapid diagnostic kits and handling lancets	Field: Training and testing staff involved in using the rapid diagnostic kits and handling lancets and disposal of contaminated /used materials. Site visits and checks by research managers and study team members	Set up of standard operating procedures at the start of the study with monitoring throughout. Responsible Party: Uganda: Nassul Kabunga and cognizant USAID AOR/AM.	Supervisor training in Kampala: 5-11/11/2016 Enumerator training for northern region districts held at Lira: 28/11/2016-8/12/2016 Enumerator training for western region districts held at Mbarara: 26/11/2016-5/12/2016 Field visits by Nassul Kabunga: 05-14/12/2016; then 10-15/01/2017 Field visits by Jacinta Dusabe: 12-16/12/2016; then 24-28/01/2017	A total of 96 (37 females and 59 males) enumerators were training in Nov/December 2016. All materials used in collecting blood samples (including lancets, cotton wool, microcuvettes, etc) were being placed in provided safety boxes. These would later be safely incinerated at health facilities. Field staff were still observing safety precautions of wearing gloves while collecting blood samples. Records were taken appropriately, and results marked such that they match the household and individual IDs.

IEE activity 4: Aflatoxin and Other Mycotoxin Assessment - Nepal					
IEE Condition(s)	Mitigation Measure(s)	Monitoring Measures(s)	Timing and Responsible Parties	Monitoring Site Visit Date/Date of training (s) and other relevant dates	Major findings of site visit
Clear safety standards and practices/protocols will be established for proper blood sample collection and handling practices and followed throughout the duration of the study.	Field: Each study involving aflatoxin or mycotoxin measurement will have a standard operating manual for blood collection and handling in the field Consultant pediatrician and an experienced nurse from his team trained the field-based nurses on attaching pediatric urine bags, precautions, and disposal of biological wastes such as pipette tips, urine bags, and used diapers. Training was carried in May 20 to May 25, 2018. In addition, a lab technician from the team trained the nurses on pipetting of urine samples and proper disposal of used products (e.g., filter tips, diapers, bags) following the process Some team members were trained on ASQ component starting July 2 to July. The environmental impact of	Field: Trained staff involved in blood and urine sample collection, processing and disposal of needles and other materials used for blood and urine collection were regularly monitored by research manager, research coordinator and study investigators ASQ trained staff were monitored by research manager and research coordinator	Responsible Party: At the start of the study with monitoring through the study. Nepal: Johanna Andrews-Trevino and Research Manager at Helen Keller International	Training 1: May 20th, 2018 to May 25, 2018. Consultant pediatrician and an experienced nurse trained the field-based nurses and staff on urine sample collection process, precautionary measures and waste disposal process. Lab technicians from the study team trained the field-based nurses on pipetting of urine samples and proper disposal (of pipette tips, bags) following the pipetting of urine samples. Monitoring period 1: May 27, 2018 to June 8. In this period, the field-based activities were closely monitored by research manager and research coordinator to ensure all blood and urine sample collection process was done as per standard protocol. Both ensured proper disposal of food and clinical waste as per the guidelines. Subsequent monitoring visits by field-based RM and RC: June 12, June 14, June 21, June 22, June 28, July 4, July 5, July 10, July 23, July 25, August 1, August 2, August 3, August 6, August 7, August 8	Training 1 Findings: All the field nurses and field staff quickly learned standards and process involved in collecting urine samples as well as guidelines of bio-hazard waste disposal. (i.e., urine collection bags, diapers, pipettes.) Monitoring Period 1 Findings: It was found that all the nurses collecting blood samples were properly following the protocol for infant venous blood and urine sample collection. The nurses were properly disposing all clinical waste (such as needles, lancets, cotton swabs, urine bags, diapers, etc.) Eventually, the bio-waste was disposed in Nepalgunj Medical college Subsequent monitoring visits, Findings: The field team were reminded regularly about following the safety standards and protocol. Minor issues during monitoring visits (such as necessity to regularly clean field-based site) was improved. Procedures for waste management (especially managing food and clinical waste separately and properly) were streamlined to improve efficiency and effectiveness of the process. The ASQ staff cleaned the toys used in ASQ regularly. Study investigator visit 1 and 2, findings: A decision to use biodegradable paper cups instead of plastic cups during lunches to reduce environmental impact. The availability and feasibility of using paper plates was discussed and followed up. However due to lack of

	ASQ assessment was found to be minima			During these visits, both blood sample and urine sample collection processes were monitored. The field team was provided instructions and feedback based on the observations. The RC specifically monitored ASQ assessment activities. Study investigator visit 1: June 27 Monitoring of urine sample collection process Study investigator visit 2: August 6, August 7 Monitoring of urine sample collection process and ASQ assessment	availability and time constraints, it could not be implemented.
	Lab: All Assessments being conducted will have a standard operating procedure. Strict quality assurance procedures will be established. The lab will adhere to standard **biohazard** protocols for lab safety as prescribed by their parent institution.	Lab: Quality assurance testing is routinely conducted by the Labs of Dr. Wang. Adherence to bio-hazard protocols. Training and testing of staff involved in handling and analyzing samples	Responsible Party: Aflatoxin Assessment for Nepal: Dr. Jia Sheng Wang (UGA), Nutrition Innovation Lab partner	Quality assurance and lab safety inspection (research compliance) date: 12/07/2017, Training and testing of staffs: 1) Blood borne pathogens training: 01/16/2018 (updated), Biohazard waste handling: 9/6/2017, RTK Global Harmonized System training: 9/6/2017	Finding 1: Lab safety inspection: IBC protocol is up to date, lab specific biosafety plan available, passed biohazard waste disposal inspection, Appropriate PPE is worn during lab activities, passed chemical and radiation safety checklist

Appendix 5: Feed the Future Innovation Lab for Nutrition Annual Work Plan: Fiscal Year 2021

Annual Work Plan (FY 20 & FY21) - Feed the Future Innovation Lab for Nutrition

Project Goal: Generate rigorous evidence on how to leverage agriculture for improved nutrition, including scaling up multi sector interventions and effective nutrition governance implementation

Objectives, Activities and Sub-activities	Timeline of activity (October 1, 2019 to September 30, 2020 - (FY2020)												Timeline of activity (October 1, 2020 to September 30, 2021 - (FY2021)												Location of Activity	Person or Institution Responsible	Notes
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
Objective 1: Understanding Agriculture to Nutrition Pathways																											
Activity 1.1: Plan and implement the fifth POSHAN policy survey in Nepal																											
1.2.1 Finalize questionnaires																									USA and Nepal	Tufts, HKI, PAHS	
1.2.2 Finalize modifications to protocols including any IRB amendments needed																									USA and Nepal	Tufts, HKI, PAHS	
1.2.3 Implement survey across all panel sites - prepare clean final combined dataset																									USA and Nepal	Tufts, HKI, PAHS	
Activity 1.2:Finalize analysis of POSHAN Community Studies data																											
1.3.1 Finalize paper themes																									USA and Nepal	Tufts, Purdue, JHU	
1.3.2 Develop analysis plans and undertake analysis																									USA and Nepal	Tufts, Purdue, JHU	
1.3.3 Paper write up, review and draft for submission																									USA and Nepal	Tufts, Purdue, JHU	
Activity 1.3 Finalize analysis of POSHAN Policy panel survey in Nepal																											
1.3.1 Finalize paper themes																									USA and Nepal	Tufts, HKI, PAHS	
1.3.2 Develop analysis plans and undertake analysis																									USA and Nepal	Tufts, HKI, PAHS	
1.3.3 Paper write up, review and draft for submission																									USA and Nepal	Tufts, HKI, PAHS	
Activity 1.4: Finalize analysis of longitudinal birth cohort study in Uganda																											
1.4.1 Finalize paper themes																									USA and Uganda	Makerere, Tufts, Harvard, BCH	
1.4.2 Develop analysis plans and undertake analysis																									USA and Uganda	Makerere, Tufts, Harvard, BCH	

1.4.3 Paper write up, review and draft for submission																									USA and Uganda	Makerere, Tufts, Harvard, BCH	
Activity 1.5: Finalize analysis of panel data in Uganda																											
1.5.1 Finalize paper themes																									USA and Uganda	Makerere, Tufts, Harvard	
1.5.2 Develop analysis plans and pursue analysis on fully cleaned and merged 3 panel dataset																									USA and Uganda	Makerere, Tufts, Harvard	
1.5.3 Paper write up, review and draft for submission																									USA and Uganda	Makerere, Tufts, Harvard	
Activity 1.6: Analysis of secondary data on complex links among agriculture, nutrition, economic drivers																											
1.6.1 Data analysis, scientific reporting and dissemination																									USA	Purdue	
Activity 1.7: Tanzania Evaluation of data on agriculture, nutrition, and health linkages																											
1.7.1 - Review and provide input on data analysis																									USA, Tanzania	Harvard (WF & IM)	
1.7.2 - Review and provide input for publications originating from this project																									USA, Tanzania	Harvard (WF & IM)	
Objective 2: Study Neglected biological mechanisms and pathways																											
Activity 2.1: Aflacohort study in Banke district, Nepal																											
2.1.1 Finalize papers for the first phase of Aflacohort																									USA, Nepal	Tufts, HKI, PAHS	
2.1.2 Finalize papers for follow up study on other mycotoxins and a 24-month anthropometry assessment																									USA, Nepal	Tufts, HKI, PAHS	
2.1.3 Conduct dissemination and policy interactions around Aflatoxin findings																											
2.1.4 Present findings at the Annual Symposium in Nepal																									Nepal	Tufts, HKI, PAHS	
Activity 2.2: Assess aflatoxin exposure in children under five in Nampula province, Mozambique.																											
2.2.1 Conduct an analysis workshop in Maputo																											
2.2.2 Conduct analysis																											
2.2.4 Present findings to the Technical Advisory Committee																											
2.2.5 Disseminate findings in Mozambique																									USA and Mozambique	Tufts, TBD	
2.2.3 Present findings at conference																											
2.2.4 Publish manuscripts																											
Objective 3: Study aspects of household and community resilience to environmental climate/seismic shocks and price volatility																											

Activity 3.1: Analysis of modules on vulnerability and risk on household nutrition and resilience																											
3.1.1 Paper write up, review and draft for submission																										USA and Nepal	Tufts, JHU	
3.1.2 Present findings at the annual symposium																										USA and Nepal	Tufts, JHU	
Objective 4: Building capacity in nutrition and agriculture																											
Activity 4.1: Support students to the Bangalore Boston Nutrition Collaborative																											
4.1.1 Award Sub-award to St Johns Medical College																										Boston	Tufts ME	Activity cancelled due to ongoing COVID-19 pandemic
4.1.2 Selection of FTF country candidates for BBNC (Nepal, Uganda, Bangladesh, Cambodia, Malawi)																										India	St Johns, Harvard, Tufts	Activity cancelled due to ongoing COVID-19 pandemic
4.1.3 Implement course																										India	St Johns, Harvard, Tufts	Activity cancelled due to ongoing COVID-19 pandemic
4.1.4 Bi-monthly webinar series to disseminate findings to students in Nepal, India, Uganda, Malawi and Bangladesh																										USA	USA	
Activity 4.2: Implement the annual Scientific Symposium in Nepal																											
4.2.1 Plan and implement the Annual Scientific Symposium (ongoing dissemination through bi-monthly webinar series)																										Nepal, USA	JHU, Tufts, IOM, NARC, NTAG	Activity cancelled due to ongoing COVID-19 pandemic
Activity 4.3: Plan and Implement the 3rd Nepal Nutrition Innovation Lab Collaborative Course on Research Methods and Grant Writing																											
4.3.1 Develop agenda																										Nepal, USA	Tufts, IOM, FWD, PAHS	Activity cancelled due to ongoing COVID-19 pandemic
4.3.2 Engage stakeholders and advertise course																										Nepal, USA	Tufts, IOM, FWD, PAHS	Activity cancelled due to ongoing COVID-19 pandemic
4.3.3 Plan logistics and event																										Nepal, USA	Tufts, IOM, FWD, PAHS	Activity cancelled due to ongoing COVID-19 pandemic
4.3.4 Implement course																										Nepal, USA	Tufts, IOM, FWD, PAHS	Activity cancelled due to ongoing COVID-19 pandemic

Activity 4.4: Plan and Implement the 2nd Uganda national Agriculture-to-Nutrition Symposium																											
4.4.1 Develop agenda for 2nd annual scientific symposium on agriculture-nutrition pathways																									USA, Uganda	Tufts, Makerere, Harvard	Activity cancelled due to ongoing COVID-19 pandemic
4.4.2 Advertise symposium and engage stakeholders																									Uganda	Tufts, Makerere, Harvard	Activity cancelled due to ongoing COVID-19 pandemic
4.4.3 Solicit/select research abstracts																									Uganda	Tufts, Makerere, Harvard	Activity cancelled due to ongoing COVID-19 pandemic
4.4.4 Plan logistics and event and conduct a 2nd Ugandan Annual Scientific Symposium (ongoing dissemination through bi-monthly webinar series)																									USA, Uganda	Tufts, Makerere, Harvard, GoU	Activity cancelled due to ongoing COVID-19 pandemic
Activity 4.5: Plan and Implement a Scientific Symposium in Bangladesh																											
4.5.1 Develop agenda the scientific symposium																									USA, Bangladesh	Tufts, HKI, GOB MoA, BNNC, BAU	
4.5.2 Advertise symposium and engage stakeholders																									USA, Bangladesh	Tufts, HKI	
4.5.3 Solicit/select research abstracts																									USA, Bangladesh	Tufts, HKI, GOB MoA, BNNC, BAU	
4.5.4 Plan logistics and event and manage Scientific Symposium in Bangladesh																									USA, Bangladesh	Tufts, HKI, GOB MoA, BNNC, BAU	
4.5.5 Bangladesh final country report																									USA		
Activity 4.6: Capacity building for Nutrition Innovation Lab partners (Nepal and Uganda)																											
4.6.1 Strengthen technical capacity for interdisciplinary research focused on nutrition																									Nepal, Uganda	IOM, PAHS, Makerere, IFPRI, JHU, Tufts, Harvard	
4.6.2 Conduct quarterly meetings with Innovation Lab graduates virtually																									Nepal, Uganda	JHU, Tufts, Harvard	Activity cancelled due to ongoing COVID-19 pandemic
4.6.3 Organize and conduct >1 lecture/workshop at a local research institution. This has been replaced with bimonthly webinar series in FY 2021.																									Nepal, Uganda	JHU, Tufts, Harvard	Activity cancelled due to ongoing COVID-19 pandemic
Objective 5: Information Dissemination																											
Activity 5.1: Presentations																											
5.1.1 Presentations at national and international conferences; US presentations																									USA, Nepal, Uganda	Tufts and all partners	

in the form of webinars or live meetings/conferences as appropriate.																											
5.1.2 NIL Virtual Conference (July 2021)																									Tufts	Tufts and all Labs	
5.1.3 NIL Dissemination in international conferences (Malawi ANH 2020)																											Activity cancelled due to ongoing COVID-19 pandemic
5.1.4 NIL Dissemination in international conferences (Micronutrient Forum 2020)																											Activity cancelled due to ongoing COVID-19 pandemic
5.1.5 Aflacohort Dissemination and ongoing policy dialogue (in collaboration with PHLIL)																											Activity cancelled due to ongoing COVID-19 pandemic
Activity 5.2: Regional and National Level dissemination events																											
5.2.1. Disseminate study findings through bimonthly webinars (FTF ZOI study sites) in all NIL focus countries																									Uganda, Nepal, Mozambique, Bangladesh, USA	Tufts and all partners	
Activity 5.3: Publications																											
5.3.1 Peer reviewed publications																									USA, Nepal, Uganda, Mozambique (if ready)	All partners involved	
Activity 5.4: Media																											
5.4.1 Maintenance and regular updates to Website																									USA	Tufts	
5.4.2 Use of Twitter and other forms of social media to disseminate policy relevant messages and webinar series																									USA	Tufts	
5.4.3 Discuss development of a communication strategy for all of NIL work and consider soliciting help from outside consultant related to Legacy Report.																									USA	Tufts	
Objective 6: Governance of the Nutrition Innovation Lab																											
Activity 6.1: Board of Directors																											
6.1.2 Host the Board of Directors & all partners meeting																									USA	Tufts	
Activity 6.2: Research analysis meetings																											

6.2.2 Host multiple team meetings with PIs and co-PIs from collaborating institutions to ensure joint collaboration and expedite the research analysis processes																										USA	Tufts	
Objective 7: Database Management and Curation of Data																												
7.1: Nepal: Manage and curate PoSHAN Community Studies datasets per USAID regulations																										USA	JHU, Tufts	
7.2: Nepal: Manage and curate Aflacohort birth cohort study datasets per USAID regulations																										USA	Tufts, HKI, PAHS	
7.3: Nepal: Manage and curate PoSHAN policy process survey datasets per USAID regulations																										USA	Tufts, HKI, PAHS	
7.4: Nepal: Manage and curate Frontline Workers study datasets per USAID regulations																										USA	Tufts, HKI, PAHS	
7.5: Nepal: Manage and curate Action Against Malnutrition through Agriculture (AAMA) datasets per USAID regulations																										USA	Tufts	
7.6: Nepal: Manage and curate child development (Heifer study) in rural Nepal datasets per USAID regulations																										USA	Tufts, Heifer	
7.7: Bangladesh: Manage and curate BAHNR study datasets per USAID regulations																										USA	Tufts	
7.8: Mozambique: Manage and curate Aflatoxin study datasets per USAID regulations																										USA	Tufts	
7.9: Uganda: Manage and curate Birth Cohort Study datasets per USAID regulations																										USA	Tufts, Harvard, Makerere	
7.10: Uganda: Manage and curate Panel datasets per USAID regulations																										USA	Tufts, Harvard, Makerere	
7.11: Tanzania: Manage and curate HANU study datasets per USAID regulations																										USA	Tufts, Harvard	
7.12: Sierra Leone: Manage and curate EED sub-study datasets per USAID regulations																										USA	Tufts	