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

Innovation Lab for Nutrition

Annual Report

October 1st, 2015 - September 30th, 2016

Building the evidence base for policies that leverage agriculture for nutrition

Award
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Feed the Future Innovation Lab for Nutrition

U.S. Government Partners

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

Feed the Future Innovation Lab for Nutrition
Annual Report
Fiscal Year 2016 (Year 6)

Management Entity Information

Tufts University's Friedman School of Nutrition Science and Policy is the Management Entity (ME) for the Feed the Future Innovation Lab for Nutrition (hereafter called the Nutrition Innovation Lab). The Nutrition Innovation Lab's core activities are funded under cooperative agreement AID-OAA-L-10-00006 from the United States Agency for International Development (USAID). Additional work is funded through USAID mission Associate Awards or Buy-Ins and with funding from other donors.

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[1] From October 1, 2012- July 31, 2016
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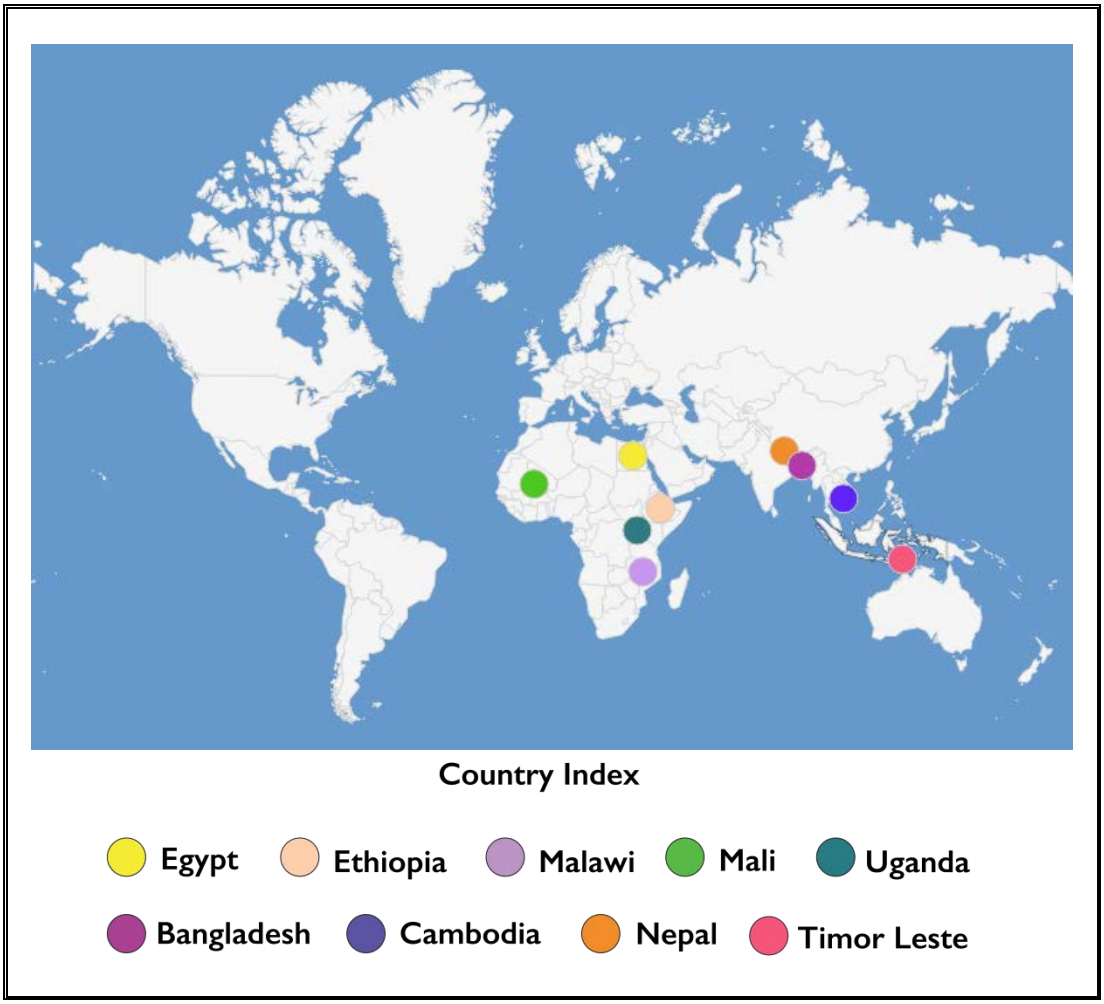
Map Indicating Countries in which the Nutrition Innovation Lab has been Working



Nutrition Innovation Lab Partners

US Partners	Johns Hopkins University Harvard University Purdue University Tuskegee University University of Georgia University of California, Davis International Food Policy Research Institute (IFPRI) National Aeronautics and Space Agency (NASA)
Nepal-Based Partners	Child Health Division, Ministry of Health and Population National Planning Commission Tribhuvan University/Institute of Medicine (IOM) Patan Academy of Health Sciences (PAHS) Nepali Technical Assistance Group (NTAG) Helen Keller International (HKI/Nepal) Save the Children/Nepal (USAID Suaahara program) National Agricultural Research Council (NARC) Heifer/Nepal
Bangladesh-Based Partners	WorldFish (Bangladesh) Horticulture Innovation Lab (University of California, Davis) AquaFish Innovation Lab (Oregon State University) Dhaka University (Bangladesh)
Cambodia-Based Partners*	World Vegetable Center WorldFish (Cambodia) Royal Agriculture University (Cambodia)
Malawi-Based Partners	Lilongwe University of Agriculture and Natural Resources (LUANAR) University of Malawi, College of Medicine (COM) South African Medical Research Council (SAMRC) Food and Nutrition Technical Assistance (FANTA) Ministry of Health (MoH)
Egypt-Based Partners	El Zanaty & Associates GOTHI, Viral Hepatitis Research Laboratory (VHRL) World Bank

* A study in Cambodia is currently being explored.

Other International Partners	University of Bergen (Norway)
	Leverhulme Centre for Integrative Research on Agriculture and Health-University of London (LCIRAH)
	London School of Hygiene and Tropical Medicine
	UNICEF
	Save the Children (SAVE)
	Heifer International
	Australian Department of Foreign Affairs and Trade (DFAT)
	University of Indonesia-Jakarta
	St. John's Research Institute (Bangalore, India)
	SPRING (USAID program)

Acronyms

AAEA - Agricultural & Applied Economics Association
BBNC - Bangalore Boston Nutrition Collaborative
BIFAD - Bureau for International Food, Agriculture and Development
FTF - Feed the Future
GAIN - Global Alliance for Improved Nutrition
HKI - Helen Keller International
IFPRI - International Food Policy Research Institute
INGO - International Non-Governmental Organization
IOM - Institute of Medicine (Nepal)
JHBSP - Johns Hopkins Bloomberg School of Public Health
LCIRAH - Leverhulme Centre for Integrated Research on Agriculture and Health (University College London)
NGO - Non-Governmental Organization (or private voluntary organization)
NASA - National Aeronautics and Space Agency
NTAG - Nepali Technical Assistance Group
PAHS - Patan Academy of Health Sciences (Nepal)
SDG2 - Sustainable Development Goals 2
UNICEF - United Nations Organization for Children
UNSCN - United Nations Standing Committee on Nutrition
VaRG - Valley Research Group (Nepal)

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I) Executive Summary

The Nutrition Innovation Lab pursues research on: i) how agriculture can be leveraged to achieve improved nutrition; ii) how multiple sectors of policy and program activity can be more effectively integrated to achieve improvements in maternal and child nutrition at scale; and, iii) what role is played by neglected biological mechanisms (such as exposure to dietary aflatoxins or to open defecation) in impairing nutrition. An external review was undertaken of the Nutrition Innovation Lab's work in Asia (as well as in Africa) during Fiscal Year (FY) 2015. That review offered considerable praise for the research and capacity-building work undertaken in Asia, and it offered constructive suggestions for enhancements, which were incorporated into the Nutrition Innovation Lab's FY 2016 activities.

During FY 2016, the Nutrition Innovation Lab continued to support a series of ongoing field studies in several challenging contexts in both sub-Saharan Africa and South Asia. Some individual studies wrapped up their data collection during the year (such as the birth cohort study in Uganda). Other facets of research planned or initiated further rounds of panel data collection (such as the PoSHAN work and AflaCohort study in Nepal and the upcoming final survey round for the Community Connector surveys in Uganda). A new research was initiated (such as two rounds of data collection in Bangladesh and extensive planning for a FY 2017 study to be conducted in the Far West of Nepal). Data management and analyses for all these activities has continued apace, allowing for numerous presentations to be made and papers to be produced.

A total of 69 oral presentations and four poster presentations were made by the ME and/or its core partners during FY 2016, focusing on activities in Asia and Africa. Specifically, 42 of these had an Asia focus, 24 had an Africa focus and seven were global. A total of 17 papers and 13 abstracts were published in FY 2016. Of these two were reports, one book chapter and 14 peer-reviewed publications. Six of the papers were globally focused, four with an Africa focus and seven with an Asia focus. Three Nepali students and two Ugandan students were supported in their graduate-level studies. In addition, in Nepal, 467 individuals received short-term skills training (including 210 women and 257 men). In Uganda, 742 individuals received short-term skills training (including 292 women and 450 men). Tribhuvan University graduated the first batch of five students from its new nutrition specialization of the Master's degree in Public Health (which was designed with significant input and guidance from Tufts University). The 4th Annual Scientific Symposium was held in Nepal in July 2016 with funding from the USAID/Nepal mission, attracting approximately 340 participants over three days.

II) Program Activities and Highlights

The Nutrition Innovation Lab's research continues to generate impactful findings and wide interest among donor, government and academic partners. Several streams of multi-year research continued and new study elements were initiated. Capacity-building activities continue to be expanded where it is possible to leverage prior investments and/or funding from non-core sources.

<u>Research Activities</u>

Demonstrating the pathways from agriculture to nutrition:

- Completed a fourth round of data collection in **Nepal** at 21 sites with more than 4,300 households on links among agricultural practices, diets, engagement with markets and health and nutrition outcomes. Numerous papers have been drafted using the combined datasets and more in-depth complex analyses are underway.

- Completed the first two of a planned four rounds of data collection in **Bangladesh** focused on integrated aquaculture and horticulture programming on diets and nutrition (of both producers and market-based consumers). Data will be analyzed in FY 2017 and linked to the subsequent rounds.
- The groundwork was laid for a new survey in **Cambodia** on vegetable garden production (seeds with technical training and nutrition education) to assess impacts on diet quality among rural children.

Multisector programming and policies for nutrition:

- Completed a fourth round of data collection in **Nepal** on the knowledge, capacity and commitment of civil servants working across sectors for the government's multisector nutrition plan. The data will be linked to earlier rounds to analyze change in terms of effects of training, fiscal empowerment and policy guidance.
- Prepared and finalized a third and final round of panel data collection to assess effects of **Uganda**'s Community Connector. The survey will be implemented in late 2016/early 2017.
- Completed the first two of a planned four rounds of data collection in **Bangladesh** exploring the uptake, use and viability of three innovations relating to the production, drying or storage of agricultural produce. In collaboration with the Horticulture Innovation Lab, additional data are being collected on costs and likely effectiveness of such technologies.
- A survey of knowledge and practices among frontline workers in **Nepal** is in the process of being analyzed to assess what capacity building may be required at field level to successfully implement multisector programming for nutrition. This study is in collaboration with USAID's Suaahara program.

Exploring Neglected Biological Pathways linking Agriculture and Nutrition:

- The birth cohort study in **Uganda** completed field data collection in July 2016. Households with pregnant women were visited and followed-up post-birth until all children in the cohort reached six months of age. Bloodwork will allow an assessment of aflatoxin exposure among the mothers and infants and this will be analyzed in relation to other potential determinants of birth outcomes and child stunting.
- A similar birth cohort continues to be implemented in one district in **Nepal**. Enrollment of 1,600 women was due to end in early FY 2017, with follow-up visits to the children due to continue into 2017. In addition to blood samples for aflatoxin analysis, mothers' breast milk samples are also collected.
- A separate study in **Nepal,** led by Heifer International, also continues–focused on the role of animal source foods in child growth. It considers the impact of livestock interventions at community level on diet quality and nutrition outcomes. In collaboration with Harvard University, a pilot study was also conducted on the potential for measuring cognitive outcomes has also been explored. The successful testing of validated metrics of cognitive development will be applied to a large group in FY 2017.
- Two of the major constraints to assessments of mycotoxin exposure in nutritionally-vulnerable populations are: a) the challenge of establishing cold-chain to move blood samples from remote locations in low income countries; and, b) the cost of laboratory-based assays. The Nutrition Innovation Lab is exploring ways to address these challenges. First, a close collaboration with the University of Georgia is permitting an exploration of the use of dried blood spots rather than serum for analysis of aflatoxin exposure; comparisons of outcomes from identical individuals will be reported in FY 2017. Second, a novel DELFIA approach to conducting aflatoxin assays in being validated in Boston; a proof of concept report will be delivered in early FY 2017 based on comparing the sensitivity, accuracy and validity of data generated utilizing the new techniques.

Capacity Building

The important catalyzing role played by the Nutrition Innovation Lab in promoting science and policy dialogue in Africa and Asia is highlighted by the following activities:

Capacity Building in Asia:

- Three Nepali students were supported for graduate studies.
- Two Nepali candidates were supported to the BBNC, (one woman and one man).
- The 4th Annual Scientific Symposium was organized in Kathmandu with USAID mission support. With attendance at approximately 340, participation has almost tripled since the first Symposium in 2012. The quality of presentations, posters and debate has dramatically increased over these years.
    - Thirty presentations were made by researchers involved in the Nutrition Innovation Lab's activities, reaching an aggregate audience in FY2016 of approximately 20 people.
    - A day of workshops was organized in July 2016 for Nepali researchers, teachers and students on the rigor and evidence quality of development policy. They included presentations by faculty from the Institute of Medicine, Patan Academy of Health Sciences, Johns Hopkins University and Tufts University.
    - The ME's engagement with Nepal's Institute of Medicine over several years on curriculum design and development for a new nutrition specialization within its Master's degree in Public Health came to fruition. Tribhuvan University enrolled a first cohort of 22 students in this specialization and the first five graduated in FY 2016.

Capacity Building in Africa:

- Two Ugandan students were supported for graduate studies.
- Two Ugandan candidates were supported to the BBNC (one woman and one man).
- Twelve Dissemination Workshops at the district level were organized July to August 2016. A total of 632 people attended these workshops
- Seventy-one individuals were trained in survey techniques and methods for the birth cohort study, the L&M study in infants and the data collection for aflatoxin analysis within the birth cohort study.
- The first Malawian Dietetics Program was launched with a total of six students enrolled in the program.
- Aflatoxin analysis capacity building assessment accomplished by University of Georgia with a clear plan presented to the Ministry of Health and the USAID Mission in Egypt.

While significant capacity-building outputs were achieved, post-doctoral fellowships which were slated for FY 2016 were not awarded. The Innovation Lab ME developed a RFA based on input from partner organizations on the areas of focus. The RFA was expected to be released in July/August 2016, however there have been delays related to determining the exact nature of the employment for the post-doctoral fellows (i.e. within each partner institution). This has led to a delay in the award of these fellowships. It is anticipated that in the first half of FY 2017, these issues will be sorted out and two post-doctoral fellowships will be awarded.

III) Key Accomplishments (Fiscal Year 2016)

The Nutrition Innovation Lab has a threefold mandate: i) impactful policy-relevant research; ii) individual capacity building; and, iii) institutional capacity enhancement.

Policy-Relevant Research Outputs

- *Dissemination of research findings:* During Fiscal Year 2016, Nutrition Innovation Lab collaborators (including local partners) made 69 **individual presentations** and four poster presentations in a range of venues which are summarized in Appendix 2. Many were presentations co-authored with and sometimes led by, local collaborators. Others were individual efforts by the ME, US partners as well as local partners. The total (aggregate) audience participating in these presentations was more than **2,700 people**—individuals directly exposed to new thinking and findings generated by Nutrition Innovation Lab activities.
- *Publications and reports:* 17 papers, (14 peer reviewed, two reports, one book chapter) and 13 abstracts were published/released during FY 2016 (detailed in Appendix 3). The majority of these include developing country partners and co-authors.
- *Students educated at a graduate degree level*: Three Nepali students, two Ugandan students and six Malawian students were supported in graduate studies relevant to an enhanced professionally-relevant understanding of agriculture and nutrition (one woman and two men); one graduated this year, so four continue to receive various forms and levels of support.
- *Short term Training:* Almost 1,700 individuals received short-term training in Asia and Africa in FY 2016. A total of 799 individuals in Africa (483 men, 316 women) and 896 in Asia (549 men and 347 women) obtained short-term training in various forms, through workshops associated with the Scientific Symposium, the intensive Bangalore training and professional training in survey implementation. Disaggregated numbers by country (Uganda, Nepal, Bangladesh) are presented in Section V.

Institutional capacity development

- As planned, nine Nepal-based institutions gained enhanced capacity to engage with and undertake policy-relevant research linking agriculture to nutrition. These included: i) the Ministry of Health's Child Health Division (through trainees participating in the Bangalore training); ii and iii) two local survey organizations, which received rigorous retraining in survey management, instrument preparation, study implementation and data entry/cleaning and analysis); iv) the Nepal Agricultural Research Council; v and vi) Helen Keller International/Nepal and Heifer/Nepal; vii) the Nepal Technical Assistance Group benefitted from further training in survey methods; viii) Tribhuvan University/Institute of Medicine (IOM); and, ix) the Patan Academy of Health Sciences (through partnership in the PoSHAN policy research and establishment of the AflaCohort study).
- As planned, six Uganda-based institutions gained enhanced capacity to engage with and undertake policy-relevant research linking agriculture to nutrition. These included: i) Makerere University: School of Agriculture Sciences; ii) Makerere University: School of Public Health; iii) Gulu University; iv) FHI 360 (Uganda Community Connector Prefect); v) Government of Uganda districts and line ministries; and, vi) National Agriculture Research Council.

IV) Research Program Overview and Structure

The Nutrition Innovation Lab constitutes a research platform, which provides numerous opportunities for cutting-edge research on agriculture, diets and nutrition in developing countries. Such research has an applied focus (operations or "delivery science" research rather than "bench science"), it is country-owned (supporting research which includes national stakeholders and informs locally-defined priorities in food and nutrition) and it allocates resources to few grants at larger scale, rather than many small grants supporting studies of experimental or pilot activities. The research is pursued in ways which seek to enhance policymaker understanding of how to overcome constraints in policy and program design and implementation, while also producing global public goods in the form of new scientific knowledge of relevant and diverse settings.

Following these principles, the Nutrition Innovation Lab is framed by three over-arching research questions, namely: 1) How can investments in agriculture achieve measurable impacts in nutrition (and can pathways to impact be empirically demonstrated)?; 2) How can multisector programs and policies be enhanced to support nutrition-specific and nutrition-sensitive actions?; and 3) What role is played in nutrition by biological mechanisms which have been relatively overlooked or ignored in past research (including aflatoxins, water quality, chemical contamination, etc.)?

Tufts University's Friedman School of Nutrition Science and Policy serves as the Management Entity (ME) for the Nutrition Innovation Lab. The Friedman School implements the program of work in partnership with several US university partners–Tuskegee, Purdue, Johns Hopkins and Harvard. Additional US universities and research entities (University of Georgia, University of Florida, University of California-Davis, NASA, as well as the International Food Policy Research Institute), European universities (Bergen in Norway, the London School of Hygiene and Tropical Medicine and the Leverhulme Centre for Integrative Research on Agriculture and Health in London) and developing-country universities (Tribhuvan University, Patan Academy of Health Sciences and St. John's Research Institute in Bangalore, Makerere University, Gulu University and the Ugandan Office of the Prime Minister and Ministry of Health) have been substantive research partners since 2012/2013.

Close collaboration is also pursued with numerous in-country partners, including Nepal's Institute of Medicine, the Nepal Agricultural Research Council, the Child Health Division of the Ministry of Health and Population and the National Planning Commission, the Nepal Valley Research Group, the Bangladesh Rice Research Institute, as well as INGOs like Heifer/Nepal, Helen Keller International, Save the Children, SPRING, FHI360 and WorldFish. In Africa, the Innovation Lab also continues partnerships with, the University of Malawi, the Lilongwe University of Agriculture and Natural Resources, the Medical Council of Malawi and the South African Medical Research Council.

V) Research Project Reports

<u>Core Funded Research Projects</u>

a) Explaining Agriculture-to-Nutrition Pathways

i) The *PoSHAN Community Panel Survey:* A panel of approximately 4,300 households (including 5,400 children under five years of age and more than 4,500 mothers) is surveyed annually in 21 research sites by Johns Hopkins University with New Era, NTAG and NARC.

ii) *Collaborators:* Johns Hopkins University, Nepal Agricultural Research Council, Nepal Technical Advisory Group, Institute of Medicine (Nepal), New Era, Purdue and Tufts University

iii) *Achievements*: The 2015 earthquake and political unrest delayed and curtailed some of the research activities in Nepal. However, the ME and its partners managed to retain key staff and implement partial surveys during 2015 and implement full survey rounds in 2016. These data are being lined up/merged with earlier rounds to generate a rich dataset which is already being analyzed in ways which will be useful to scientists and policymakers globally.

iv) *Capacity building*: A great deal of effort is put into building partner and staff capacity to undertake rigorous research. The time and resources spent in training survey firm partners, academic collaborators and interested students represents a significant contribution to long-term development in Nepal.

v) *Lessons learned*: Demand has been steadily growing for findings from this research activity. Insufficient level of effort had initially been dedicated to responding to such demand with publications as outputs. The ME rectified this in mid-FY 2015 so that analyses underway will lead to numerous publications in FY 2016.

vi) *Presentations and Publications:* Several dozen presentations were made in FY 2016 on this stream of research, both within Nepal and globally (including at several presentations for USAID audiences in Washington, DC). Analysis and writing of publications was prioritized in the second half of FY 2016, which will lead to numerous peer-reviewed publications, co-authored with many different Nepali collaborators, in 2017.

b) Measuring the Quality of Nutrition Governance

i) *PoSHAN Policy Process Research: An empirical study of the extent to which knowledge, attitudes and practices of individuals charged with cross-sectoral collaboration for nutrition actually influence program and policy fidelity, as well as household-level outcomes observed on the ground.* During Fiscal Year 2016, a fourth round of surveys was initiated (using electronic data capture) in all 21 districts targeted for resurvey by Johns Hopkins for the PoSHAN community-level surveys. Implemented by the Valley Research Group, in collaboration with Tufts University, Helen Keller International and the Patan Academy of Health Sciences, this fourth round is fully comparable with the second round and will allow for an assessment of change over time.

ii) *Collaborators:* Patan Academy of Health Sciences, Hellen Keller International, Valley Research Group and Tufts University

iii) *Achievements*: Several presentations have been made to USAID in Washington, DC and to decision makers in Nepal on early findings relating to commitment, capacity and resource use among civil servants working to improve nutrition in multiple sectors in Nepal. The feedback has been strongly positive and requests have been made by senior policymakers for further feedback and engagement. Analysis and presentations on the 2015 (nine districts) and 2016 (21 districts) datasets will accelerate in 2017.

iv) *Capacity building*: Numerous policymakers in the National Planning Commission and Ministry of Health and Population have requested personal interactions with Nutrition Innovation Lab researchers to learn more about the approach and instruments used in the governance study. This will happen early in FY 2017 through in-person dissemination of a collation of tables presenting key findings from the 2014 governance survey. Seminars will be arranged in FY 2017 for wider dissemination of results published in the special issue of *Food and Nutrition Bulletin*.

v) *Lessons learned*: The findings of early analysis suggest that such data can be very important for documenting strengths and weaknesses in governance processes for nutrition. The positive external reviews of the draft articles confirmed strong global research interest in this innovation domain of study and the credibility of the data.

vi) *Presentations and Publications:* Presentations were made on the governance findings in Nepal at the 4th Annual Scientific Symposium as well as at the USAID mission. The special issue of the *Food and Nutrition Bulletin* prepared in collaboration with SPRING includes seven articles drawing upon this stream of work.

c) Randomized Control Trial (RCT) of Impact on Nutrition of Specific Behavior Change Communication (BCC) Layered over a Livestock Training Intervention

i) *What is the value-added for nutrition of BCC beyond enhanced agricultural practices associated with livestock management?* Initiated in FY 2014, this study investigates child nutrition in communities randomized to receive one of three interventions: 1) Heifer/Nepal's community development activities and livestock training, supplemented by specific training (BCC) in child nutrition; 2) livestock training and BCC alone; or 3) no activities (control). A baseline survey was undertaken in mid-2013. A total of 960 households were enrolled in the study across the three arms, including roughly 1,300 children. A fourth round of panel data collection took place in 2016.

ii) *Collaborators:* Heifer/Nepal, Nepal Agricultural Research Council, Nepal Technical Advisory Group, Tufts University and Valley Research Group

iii) *Achievements*: As per plan, a fourth round of panel data collection took place in 2016. All data are being processed for analysis.

iv) *Capacity building*: a) Heifer/Nepal's office and field staff, as well as the Valley Research Group team, received training in Ethics of Human Subjects Research prior to each round of field work; b) Heifer/Nepal and Valley Research Group teams received mentoring in conduct of longitudinal research; c) Heifer/Nepal and Valley Research Group teams received mentoring in statistical methods; and d) Nepali dieticians were mentored in development of nutrition training curriculum.

v) *Lessons learned*: Studies such as these, in remote regions of low-income countries, require flexibility. Unforeseen events like natural disasters have caused significant delays, but the study has not been compromised–four rounds of empirical data are in hand and follow-up rounds are planned.

vi) *Presentations and Publications:* Baseline data were analyzed during 2015, leading to several presentations in Boston and Nepal during FY 2016. No publications to date.

d) Livestock Programs in Nepal: Effects on Child Health and Nutrition Four Years Post-Intervention

i) *How do interventions framed around animal use and women's empowerment: a) enhance child dietary quality overall (through consumption and/or increased income); and b) animal source food consumption specifically? How long does it take for such effects to be measurable?* Led by Heifer/Nepal and the Nepali Technical Assistance Group, this study represents a follow-up survey of a group of 415 households previously enrolled in a two-year randomized control trial which ran from 2009 through 2011. The households reside in communities which were randomly assigned to participate in a livestock-centered community level intervention or to be controls (the

communities are in Districts Nawalparasi, Chitwan and Nuwakot). The Nutrition Innovation Lab supported additional rounds of data collection in FY 2013 and FY 2014, focusing on discerning impacts on child nutrition and health, diets and incomes several years post-intervention.

ii) *Collaborators:* Heifer/Nepal, Nepal Agricultural Research Council, NTAG, Harvard University and Tufts University

iii) *Achievements*: The implementation of an RCT in Nepal despite the effects of natural disasters and political unrest has been challenging but ultimately rewarding. Two papers have now been published from this work, with several more in preparation.

iv) *Capacity building*: a) Tufts has supported the analytical work of Heifer/Nepal and NTAG, taking the methodological approaches used to a higher level than had been originally planned; b) Heifer/Nepal mentored NTAG staff in the conduct of longitudinal research project over four years; c) important research skills were developed for key staff at Heifer/Nepal office as well as among field staff; and, d) Heifer/Nepal staff and NTAG staff received training in Ethics of Human Subjects Research.

v) *Lessons learned*: A single, well-designed study has the potential to address multiple questions which go beyond the one specific research question posed in an RCT. Impacts of community-level interventions can take more than two years to be measurable.

vi) *Presentations and Publications:* Presentations were made at the 4th Annual Scientific Symposium and two widely-discussed papers were published in the *Journal of Development Effectiveness* and in *Paediatrics and International Child Health.*

e) Econometric Analyses of Secondary Data Linking Ecology, Food Systems and Nutrition

i) *Measuring links among environmental factors, agriculture and nutrition outcomes: S*everal large datasets have been merged by Purdue University, including monthly data on agricultural prices, satellite data and farm output covering 45 districts and 20 agricultural commodities. This dataset of roughly 40,000 data points now covers the period 1998-2012. In FY 2016, substantial progress was made in several analytical work streams, including finalizing the analysis infrastructure (including roads and bridges) and its relationship to nutrition outcomes. A journal article was submitted to the Proceedings of the National Academy of Sciences for review.

ii) *Collaborators:* Purdue University, NASA and Tufts University (a collaboration between the Fletcher School of Law and Diplomacy as well as the Friedman School of Nutrition)

iii) *Achievements*: Innovation multi-level modelling using large datasets has opened up an exciting realm of policy-relevant research opportunities where governments are keen to understand the interactions among proximate and distal determinants of undernutrition as well as the effectiveness of large-scale program interventions.

iv) *Capacity building*: Not applicable

v) *Lessons learned*: Collaboration among numerous academic institutions can yield powerful data capacity with unique findings on environmental links to child nutrition. Protecting 'turf' has not been a problem in this regard.

vi) *Presentations and Publications:* Dr. Gerald Shively made an impactful presentation at the 4th Annual Scientific Symposium in Nepal, as well as at several meetings of agricultural economists

in the United States. Papers have been published in high-impact journals, such as the *American Journal of Agricultural Economics* and *Economics of Human Biology*.

g) Frontline Worker (FLW) study

i) *What are the perceptions of FLWs of priority nutrition problems, solutions and worker capacities?* 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 based on one undertaken by IFPRI in late 2015 to determine the effectiveness of the 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 only in a sample of *Suaahara* sites; the present survey (pursued by the Nutrition Innovation Lab-Asia) adopted the instruments used and applied them to PoSHAN sites surveyed in 2015, plus the five "expansion" districts where *Suaahara* began to operate from 2015 onward. The data will be compared with those collected by IFPRI, with a joint publication in view.

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

iii) *Achievements*: The survey has been successfully completed in most of the intended sites, despite the logistical challenges posed by the April 2015 earthquake.

iv) *Capacity building*: Engagement with key staff of the Suaahara Project on the design of a FLW study and discussions on joint analysis and writing, have supported advances in scientific understanding among Suaahara collaborators.

v) *Lessons learned*: There is considerable scope to use the research platform established in Nepal by the Nutrition Innovation Lab-Asia for linking with other partners and adding additional (relevant) questions to the research agenda.

vi) *Presentations and Publications:* None to date

h) The Birth Cohort Study in Uganda

i) *Livelihood and nutrition interventions to improve maternal and child nutrition in Uganda:* The study has enrolled 5,044 women in 12 districts since November 2014. Following pregnancy outcomes and child growth in districts targeted by USAID's Community Connector Project (CCP) versus those in non-targeted districts permits an assessment of the potential effects on nutrition of combined CCP activities relating to agriculture, livelihood development, health promotion and market development. The birth cohort study also supports an assessment of the role of dietary aflatoxin exposure, detected in the blood of mothers and infants, in determining nutrition outcomes. At present, the cohort study is winding down since all children have now reached six months of age. As of the end of FY 2016, all data has been cleaned and shared with all the partner organizations. A meeting was held by PIs and Innovation Lab ME to confirm priority analyses. A recent graduate from the Harvard TH Chan School of Public Health is reviewing all the questionnaires to determine analyses around the role of dietary patterns and infant and young child feeding and infant growth.

ii) *Collaborators:* Makerere University, Harvard University, University of Georgia and Tufts University

iii) *Accomplishments:* At the end of FY 2016, all data collection had been completed, data cleaned and data sets available to partner organizations for analysis.

iv) *Capacity building*: Refresher trainings were held in FY 2016 to train the enumerators on survey methods and techniques. This data is presented in Section V.

v) *Lessons Learned:* During study implementation, the ME came to realize that the cost of in-country transportation of field staff was much higher than anticipated and therefore overall costs per household visit exceeded the amount originally budgeted. In addition, there were unanticipated expenses, such as a new Uganda labor tax and higher than expected expenses associated with the storage of blood samples at local health centers. As a result, the ME has decided to close down the study when all children have reached six months of age, rather than the original target of 12 months of age. If additional resources could be found, a later follow-up of the same children could be envisaged.

vi) Presentation and Publications: Data analysis is ongoing.

i) Uganda Panel Survey

i) Assessing the linkage between agriculture, food security, nutrition and health among women and children in rural Ugandan households: A repeated panel survey (baseline, midline and endline assessment) is being conducted to determine if and how the USAID Uganda Community Connector has improved production practices, incomes and nutrition. The midline assessment showed no change in key program indicators over baseline. While not a traditional impact evaluation design, the design of this study provides a snapshot of Community Connector implementation and the potential for integrated programs to affect change. The endline assessment is planned for the first quarter of Fiscal Year 2017.

ii) Collaborators: Makerere University, Harvard and IFPRI take the lead, collaborating with Tufts.

iii) Accomplishments: Preparations for the third and final panel survey relating to the USAID Uganda Community Connector Program were completed. Training and Data collection was expected to start at the beginning of the FY 2017 going through December 2016. In April 2016, a meeting was held in Kampala with the USAID Uganda Community Connector team to share lessons learned.

iv) Capacity building: None

v) Lessons learned: The Uganda Mission asked the ME to share panel data with the Community Connector Project (CCP) group before December 2016 since this is when CCP will end. However, to be able to have comparable data each year, the Nutrition Innovation Lab Panel 3 study must start in December 2016; data will only be ready to share in May 2017. We discussed this in detail during the Tufts team visit with the Mission. Dr. Nassul Kabunga and the Mission staff met with CCP staff in August 2016 to discuss appropriate timelines and came to an agreement on what data can be mutually shared with each other.

vi) Presentations and Publications: Dr. Nassul Kabunga presented the livestock anemia analysis at an IFPRI-RISE Annual Research day in Washington, DC on March 15, 2016. A paper on that analysis has been submitted to the supplement of the Proceedings of the National Academy of Science.

j) Assessment of Environmental Enteropathy in Uganda

i) Nutritional Consequences of Environmental Enteric Dysfunction (EED) in Uganda: This study explores possible risks of exposure to enteropathogens and enterotoxins in undernutrition. The goal is to understand the environmental contributors of EED. Two studies are being undertaken within this study. One study is to examine the EED levels in the birth cohort infants (n=400) and relate it to their growth pattern. Another study will focus on examining levels of EED in pregnant women (n=250) and examine the relation with birth weight of their newborns.

ii) Collaborators: Tufts, Makerere University, Harvard TH Chan School of Public Health, Mengo Health Center and Hospital in Kampala, Uganda

iii) Accomplishments: Data collection on the birth cohort infants has been completed. Urine samples await transport to the United States. The protocol for the second study has been submitted to the local IRB (Mengo IRB). It is anticipated that this study will commence in the second quarter of FY 2017.

iv) Capacity building: Fourteen enumerators were trained to conduct lactulose mannitol (LM) tests used to determine changes in gut permeability (and hence, likely gut disorders).

v) Lessons learned: Data collection for the LM test in the infants was delayed due to delays in IRB approval for the sub-study. Furthermore, there have been delays (not related to the study) in receiving approval for importing the samples. These are currently being dealt with.

vi) Presentations and Publications: None yet.

k) Food and Security, Maternal Nutritional Security Status and Psychosocial Health Outcomes Among HIV Infected and Uninfected Pregnant Women in Uganda (PRENAPs): East Africa Gulu Cohort, Uganda

i) *Effects of exposure to mycotoxins on the growth of HIV-exposed and unexposed infants:* This study involves secondary analysis of blood samples from a now-concluded study in Gulu.

ii) *Collaborators:* Gulu University, Cornell University and Harvard TH Chan School of Public Health

iii) *Achievements:* The laboratory analyses were completed at the University of Georgia. Barnabas Natamba, the PI in Uganda has also completed the analysis on aflatoxin levels in relation to infant birth weights and growth. Manuscripts are being developed.

iv) *Capacity building:* None

v) *Lessons learned:* N/A

vi) *Publications and Presentations:* Three abstracts (see list of abstracts) were submitted to *Experimental Biology* which resulted in three oral presentations (see list of presentations).

<u>Associate Award Research Project Reports</u>

a) AflaCohort Study–Nepal

i) *What is the relationship between Maternal Exposure to Mycotoxins, Birth Outcomes and Stunting in Infants?* Initiated in FY 2015, this research seeks to understand the association between maternal and infant aflatoxin exposure (rates in the blood and breast milk) and child growth. The study in 17 VDCs of Banke District has now recruited approximately 1,700 pregnant women and is following their pregnancy outcomes and infant growth up to one year of age. The levels of aflatoxin exposure will be linked to the infant's growth trajectory.

ii) *Collaborators:* Patan Academy of Health Sciences, Hellen Keller International, Valley Research Group, Tufts University and IOM

iii) *Achievements*: Despite huge logistical challenges posed to establishing cold chain in remote locations of Nepal, the partnership established with local hospitals and clinics has allowed for blood samples to be processed and stored locally prior to shipment first to Kathmandu and, later, to the US. This has been almost seamless. Despite turnover of key local staff, trainings and retraining have gone smoothly. In FY 2016, half the maternal samples were analyzed for serum aflatoxin levels. The second set of samples was transported to the University of Georgia along with breast milk samples and dried blood spots. It is anticipated that the complete analysis of maternal aflatoxin levels will be completed in early FY 2017.

iv) *Capacity building*: Local hires have been trained in gold-standard human subjects research methods and partner medical institutions were trained in best practices for the processing and storage of blood samples. Helen Keller International and Patan Academy of Medical Sciences staff has been trained in the complexities of research requiring blood and breastmilk sampling.

v) *Lessons learned*: A cold chain can be established in remote parts of Nepal, but effective collaboration is needed with key local institutions and investments are needed in freezer capacity and back-up power to ensure that the integrity of blood and milk samples obtained.

vi) *Presentations and Publications:* No publications to date but several oral and poster presentations were made using partial and preliminary data during FY 2016, including at the 4th Annual Scientific Symposium.

b) USAID's Aflatoxins and Child Nutrition - Africa:

i) *What is the relationship and subsequent impact of aflatoxin exposure on linear growth in a prospective longitudinal study design?* Data from this study are obtained from the birth cohort study which enrolled 5,044 women in 12 districts since November 2014. The birth cohort study follows pregnant women through 24 months post-partum to assess differences in pregnancy outcomes and child growth in districts targeted by USAID's Community Connector Project (CCP). This will permit an assessment of the potential effects on nutrition of combined CCP activities relating to agriculture, livelihood development, health promotion and market development.

ii) *Collaborators:* Makerere University, University of Georgia and Harvard T. H. Chan School of Public Health

iii) *Achievements:* The first set of samples has been received in Boston. Cataloging of the rest of the samples has been completed and these are being prepared for shipment to Boston.

iv) *Capacity building:* Enumerators and phlebotomists underwent retraining particularly on clinical practices and blood draws. This data is presented in Section VI.

v) *Lessons learned:* The study is ongoing. We will examine the takeaways closely and actively take them in account to benefit future projects.

vi) *Presentations and Publications:* None to date

c) Bangladesh and Cambodia Integrated Aquaculture, Horticulture and Nutrition Actions

i) *Are diets and nutrition outcomes improved more where multiple USAID programs are focused on aquatic and horticulture outputs?* Feed the Future's Learning Agenda (2012) states that there remain many unanswered questions regarding appropriate investments in agriculture for improving nutrition and diet quality. Two of the "key questions" posed by the Learning Agenda are: 1) What have been the impacts of different approaches linking Agriculture, Nutrition and

Health (ANH) to dietary diversity and nutritional status (i.e. geographic co-location of programs, integration of interventions, what combination of A, N and H)?; and, 2) Have programs to increase farmers' incomes resulted in improved nutrition when not coupled with nutrition programming? Both questions are being addressed by research, which started in Bangladesh in FY 2015, but has yet to be initiated in Cambodia. These studies are not impact evaluations in the usual sense; they are instead a rigorous approach to examining effects at a zone of influence level by assessing the impacts on purchasers as well as producer households.

ii) *Collaborators:* Horticulture Innovation Lab, AquaFish Innovation Lab, WorldFish, Helen Keller International and IFPRI.

iii) *Achievements*: In Bangladesh, the first two rounds of a four-round longitudinal panel study were implemented across the USAID Bangladesh FTF zone of influence. Data collection proceeded relatively smoothly despite the threat of violence across the country. Data is currently being merged and analyzed ready for presentation to stakeholders in Dhaka in early 2017.

iv) *Capacity building*: A total 166 individuals (95 male, 71 female) were trained in survey techniques.

v) *Lessons learned*: The detailed questions explored by the Nutrition Innovation Lab have not been asked in this manner before. This makes the expected findings all the more interesting to stakeholders involved, but it has been challenging to define the appropriate forms of questions which address little-asked queries about consumer preferences, technology adoption, perceptions of food safety and market price formation.

vi) *Presentations and Publications:* Presentations were made in Dhaka in January 2016 and March 2016. There has been one publication on the role of fisheries and aquaculture for global nutrition in *Food Policy*.

d) Development of a Low-Cost Aflatoxin Exposure Screening Method (Dissociation-Enhanced Lanthanide Fluorescence Immunoassay-DELFIA) Study

i) *DELFIA*: Serum aflatoxin measurement is both expensive and performed only by a few laboratories. This has severely limited capacity to investigate the relationships between aflatoxins and nutrition and health outcomes. A method that is sensitive (i.e., can detect low levels of aflatoxin), specific (to aflatoxin) and inexpensive, would underpin a revolution in our understanding of the relationship between aflatoxins and nutritional outcomes. The goal of this project is to develop a sensitive, low-cost assay system for aflatoxin detection in blood. We will aim to develop a system, which can use very small volumes of blood–such as are typically obtained by finger prick, not venipuncture, enhancing acceptability. Similarly, the cost per test, when batched, should be < $5 per test. Lastly, we aim to develop a test which uses easily available commercial reagents, which can be used in a low-tech environment.

ii) *Collaborators:* N/A

iii) *Achievements*: Work on the DELFIA alfatoxin assay development continued through FY 2016. Tests were conducted using different antibodies including monoclonals from Dr. John Groopman, different blocking agents, digestion versus non-digestion and use of methods to expose the aflatoxin moiety. While the correlation of aflatoxin values obtained by DELFIA compared to using digestion and HPLC (standard method) was significant but testing using a clean assay (after all conditions being tested including exposing the aflatoxin moiety using different methods—other than digestion) did not produce good dose-response relationships. A key finding is that small samples would suffice for this method making it user-friendly and the current version would work as a screening tool.

iv) Capacity building: N/A

v) Lessons learned: N/A

vi) *Presentations:* None to date

e) Nutrition Capacity Development to Meet National priorities - Malawi

i) *Nutrition Capacity Development to Meet National Priorities*: The Nutrition Innovation Lab is collaborating with the partners noted below to develop and implement a postgraduate competency based curriculum in dietetics. The course design complies with international training standards and will be subject to external review and examination. The Nutrition Innovation Lab is also collaborating with the partners to develop a food composition database specific to Malawian food and to collaborate with the Ministry of Health and the College of Medicine in Malawi to identify where nutrition can be added to the medical school curriculum based on global standard practices.

ii) *Collaborators:* Lilongwe University of Agriculture and Natural Resources, University of Malawi, College of Medicine, South African Medical Research Council, Food and Nutrition Technical Assistance and the Ministry of Health

iii) *Achievements*: These include: Dietetics Program launch; expert consultant completion of Phase I of Food Composition activity and start of Phase II; examination of medical curricula globally has been begun, with report to follow in 2017.

iv) Capacity building: All three activities mentioned above are capacity-building initiatives.

v) Lessons learned: We've learned that our partners' capacity to carry out the full dietetics program is compromised and therefore we will need to fill the labor gaps with additional staff. This requires quite a bit of additional funds and begs the question of sustainability. We have also learned that we need better direct communication to avoid unnecessary delays caused by unanswered questions from our partners. There is a direct impact on activity progress due to poor internet and phone communication.

vi) *Presentations:* A variety of presentations on all three activities progress have been undertaken at the Mission, Ministries and local partner venues. In addition, regular presentations occur hosted by all ME staff to build faculty and dietitian teaching and clinical nutrition knowledge. This is completed through live presentations and journal clubs.

f) Research on Causes and Solutions to Address Stunting in Egypt

i) The Nutrition Innovation Lab has collaborated with the partners noted below to understand the causes and examine potential solutions to address stunting in Egypt. Activities included an in-depth literature review, analysis of secondary data to examine associations between stunting and explanatory factors including individual, household and community factors and the development of study which would examine the relationship of stunting, overweight and exposure to aflatoxins. Work through FY 2016 included finalizing the data analysis and the development of a report examining the association of stunting and overweight (publication listed in Appendix 3), and the development and submission of a study protocol for implementation in four governorates. In addition, the results of the secondary analysis led to discussions with the World Bank for potential new analyses and a submission of a concept note to the World Bank.

ii) *Collaborators:* GOTHI (Ministry of Health), El Zanaty & Associates and the University of Georgia

iii) *Achievements:* Completion of secondary data analysis, finalization of protocol and receipt of security clearance for use of protocol and questionnaires, submission to local institutional review board (Ministry of Health) along with approval (Sept 30, 2016).

iv) Capacity building: The Innovation Lab worked with the University of Georgia to assess the capacity of the Egyptian Ministry of Health Central Health Laboratory to perform analyses of aflatoxin B_1-lysine adduct in blood samples and to propose options for improving the capacity of the Central Health Laboratory in terms of equipment and human capacity for such analyses in a large number of human blood samples collected in Egypt. Several different constraints were identified including lack of lab equipment, lack of qualified personnel and lack of capacity to synthesize the adduct needed to serve as a standard and for quality control procedures. Three plans were developed and presented to the USAID Mission and the Ministry of Health which would have allowed the development of aflatoxin analysis capacity in country.

v) Lessons learned: Significant work was conducted on the study protocol and several different challenges were encountered. Working in Egypt was difficult due to security constraints and also government concerns over research protocols in the public health, nutrition and social realm. Approvals took an unanticipated amount of time which significantly pushed the timeline for implementing the study. Unfortunately, due to a lack of approval for a no-cost extension on the award, the study protocol which was approved by the Ministry of Health and the highest security agency in Egypt was not implemented.

vi) *Publications and Presentations:* A report was submitted on secondary data analysis (Activity Number 2) along with an approved protocol for the third activity.

VI) Human and Institutional Capacity Development

Individual Training

Long-term Training: Asia - 3 (2 Male and 1 Female)

Name (first, last)	Sex	University	Degree	Major	Program End Date[3] (month/year)	Degree Granted [4] (yes / no)	Home Country
Prajula Mulmi	F	Tufts University	PhD	Food Policy and Applied Nutrition	2/11/2017	Yes	Nepal
Ganesh Thapa	M	Purdue University	PhD	Agricultural Economics	12/30/2016	Yes	Nepal
Ashish Pokharel	M	Tufts University	Master's	Master's in Food Science	5/30/2016	Yes	Nepal

Long-term Training: Africa - 2 (2 Male and 0 Female)
Uganda

Name (first, last)	Sex	University	Degree	Major	Program End Date[5] (month/year)	Degree Granted [6] (yes / no)	Home Country
George Omiat	M	Purdue University	PhD	Agricultural Economics	12/30/2016	Yes	Uganda
Nassul Kabunga	M	Tufts University	Postdoctoral	Postdoctoral		Yes	Uganda

[3] Anticipated graduation date or end of program support
[4] Indicate if program support resulted in a degree
[5] Anticipated graduation date or end of program support
[6] Indicate if program support resulted in a degree

Short-term Training: Asia - 467 (257 Male and 210 Female)
India/Nepal

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained M	F	Total
India	BBNC	Government Officials	1	1	2
Nepal	Fourth Annual Scientific Symposium	Government Officials, Civil and Private sector	210	130	340
Nepal	PoSHAN R4 panel training	Government Officials, Civil and Private sector	14	0	14
Nepal	PoSHAN Community Studies-4 training	Private sector	11	7	18
Nepal	PoSHAN Community Studies-4 enumerators, supervisors training	Private sector	21	72	93

Short-term Training: Asia - 166 (95 Male and 71 Female)
Bangladesh

Country of Training	Brief Purpose of Training	Who was Trained[7]	Number Trained[8] M	F	Total
Bangladesh	BAHNR survey 1 round training (enumerators and phlebotomists)	Civil Sector	47	35	82
Bangladesh	BAHNR survey 2 round training (enumerators and phlebotomists)	Civil Sector	48	36	84

[7] Such as farmers, government officials, women entrepreneurs
[8] Disaggregate by sex if known.

Aflatoxin Award: Asia 265 (198 Male and 67 Female)

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained M	F	Total
Nepal	KTM and Banke Management Team	Civil Sector	2	1	3
Nepal	Head Nurse	Civil Sector	1	0	1
Nepal	Refresher All Banke	Civil Sector	31	16	47
Nepal	Logistics Associate Banke	Civil Sector	0	1	1
Nepal	Research Manager	Civil Sector	1	0	1
Nepal	Refresher All Banke	Civil Sector	31	16	47
Nepal	Backup Lab Tech Training	Civil Sector	0	1	1
Nepal	Infant Blood Draw Refresher Kohalpur Hospital	Civil Sector	5	0	5
Nepal	Trainers of Trainee (CMR) Clinical Management of Rape and Sexual Health	Civil Sector	1	0	1
Nepal	QR Code	Civil Sector	21	2	23
Nepal	Research Manager Training	Civil Sector	0	1	1
Nepal	Ethics Refresher	Civil Sector	32	16	48
Nepal	Not Applicable, TP3 and TP4 Refresher Training	Civil Sector	21	2	23
Nepal	Data entry refresher training	Civil Sector	21	2	23
Nepal	Infant Blood Draw Assistance	Civil Sector	31	9	40

Africa: Short-term Training: 742 (450 Male and 292 Female)
India/Uganda

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained M	F	Total
Uganda	Southwest Refresher Training 11/27-28, 2015	All Civil	11	18	29
Uganda	Northern District Refresher Training 12/5/2015	Civil	13	15	28
India	BBNC 1/1/2016	Government Officials	1	1	2
Uganda	LM Training Enumerators Training	Civil	5	9	14
Uganda	Online Course on Public Health	Civil	3	12	15
Uganda	L:M Refresher Training	Civil	6	7	13
Uganda	Rukungiri Dissemination Workshop	Government Officials, Civil and Private sector	31	31	62
Uganda	Kanungu Dissemination Workshop	Government Officials, Civil and Private sector	27	16	43
Uganda	Kabale Dissemination Workshop	Government Officials, Civil and Private sector	35	30	65
Uganda	Lira Dissemination Workshop	Government Officials, Civil and Private sector	44	19	63
Uganda	Apac Dissemination Workshop	Government Officials, Civil and Private sector	49	0	49
Uganda	Kole Dissemination Workshop	Government Officials, Civil and Private sector	37	19	56
Uganda	Nebbi Dissemination Workshop	Government Officials, Civil and Private sector	28	20	48
Uganda	Atyakc Dissemination Workshop	Government Officials, Civil and Private sector	30	20	50
Uganda	Pader Dissemination Workshop	Government Officials, Civil and Private sector	23	16	39
Uganda	Lamwo Dissemination Workshop	Government Officials, Civil and Private sector	24	10	34
Uganda	Kamwenge Dissemination Workshop	Government Officials, Civil and Private sector	58	22	80
Uganda	Kabarole Dissemination Workshop	Government Officials, Civil and Private sector	25	27	52

Aflatoxin Africa: 57 (24 Male and 33 Female)

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained M	F	Total
Uganda	Southwest Refresher Training 11/27-28, 2015	Civil Sector	18	11	29
Uganda	Northern District Refresher Training	Civil Sector	15	13	28

While significant capacity-building outputs were achieved, postdoctoral fellowships which were slated for FY 2016 were not awarded. The Innovation Lab ME developed a request for application (RFA) based on input from partner organizations on the areas of focus. The RFA was expected to be released in July/August 2016 however there have been delays related to determining the exact nature of the employment for the postdoctoral fellows (i.e., within each partner institution). This has led to a delay in the award of these fellowships. It is anticipated that in the first half of FY 2017, these issues will be sorted out and two postdoctoral fellowships will be awarded.

Institutional Development

- Support for the Institute of Medicine's new nutrition specialization within Tribhuvan University's MPH degree. In partnership with Johns Hopkins University and Patan Academy of Health Sciences.

- Establishing an intensive advanced research methods training for Nepali public health and agriculture researchers. In partnership with Patan Academy of Health Sciences, the Institute of Medicine, Harvard University and St. John's Research Institute (Bangalore)

- Regular training and retraining of survey firms and researchers in Nepal. In partnership with Johns Hopkins University, Helen Keller International, NTAG and Heifer/Nepal.

- Supporting an annual Scientific Symposium and associated workshops in Nepal to enhance local capacity to propose, support and present high-quality research. In partnership with Johns Hopkins University, NTAG, Helen Keller International, IOM, NARC and PAHS.

- Supported human capacity development of young professionals in Uganda: a nutritionist from Mulago Hospital (government-run hospital) and an agricultural engineer from the National Agricultural Research center).

- Regular training and retraining of team members/graduate students and staff from Makerere University.

- Continued use of hybrid online course on public health developed by Dr. Henry Wamani from Makerere University.

- Supporting the dissemination of nutrition and food security indicators in district level workshops which provide data and information for future local government planning.

VII) Technology 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 Labs' (Asia and Africa) main intellectual property relates to dissemination of research findings which directly impact policy and program design and the methods of implementing both. The one technology transfer which may represent an important step forward in research in Nepal is the programming and use of electronic tablets for implementing surveys in the field. While this has already been done in the context of Demographic and Health Surveys, it has not been extensively used in: a) the context of interviews relating to policy processes at all levels of governance; and b) the remotest parts of the country, including the Western Mountains. Documenting the process, cost and time-savings involved in

tablet-based data collection will represent an important upgrading of local research capabilities in-country.

VIII) Environmental Management and Mitigation Plan (EMMP) (status report)

As per USAID regulations, an Institutional Environmental Evaluation (IEE) was submitted and approved. 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 EMMP was formed after reviewing the governing IEE/EA and conditions, which apply to the project, were then translated into specific mitigation actions. Monitoring measures, timelines and responsible parties were specified. Institutions responsible include UC Davis's Horticulture Innovation Lab (Bangladesh), Patan Academy of Health Sciences (Nepal), Makerere University (Uganda) and Kohalpur Medical and Teaching Hospital (Nepal). An update on the EMMP is currently being worked as updates have been provided for the EMMP in Bangladesh. The Innovation Lab will work with Dr. Ahmed Kablan to ensure the EMMP changes undergo due review and approval. Dr. Kablan visited the field site in Nepal for the Aflacohort Study and conducted a review/assessment of the EMMP protocol in place. He indicated that the practices in the field were in line with the protocol.

IX) Open Data Management Plan (status report)

In October 2015, the Nutrition Innovation Lab developed its data management plan (DMP), which was approved by the USAID. The Nutrition Innovation Lab will generate a series of diverse data sets which range from longitudinal household panel data, including: agriculture, food security, household consumption and expenditure, water, hygiene, sanitation, water quality, longitudinal individual data on nutrition, diet, health, biomarkers (i.e., serum aflatoxins, micronutrients, gut microbiome, environmental enteropathy) and anthropometry, as well as longitudinal policy level data on nutrition and governance. Institutions, which are responsible and/or involved in this effort, include Tufts University, Johns Hopkins Bloomberg School of Public Health, Harvard TH Chan School of Public Health, Makerere University and Purdue University.

In FY 2016, the Innovation Lab worked with Tufts Technology Services in developing a platform for data sharing (Lab Archives). Currently, the platform hosted by Tufts University allows sharing of data across all the Innovation Lab partner institutions. Per the DMP, data will be released to public access on this platform. Significant amount of work is still needed particularly on developing the metadata and procedures as well as coding manuals for the different studies (listed in the DMP). In FY 2017, the Innovation Lab will review the DMP and request re-approval of the DMP if any changes/additions are made.

X) Project Management Activity

In FY 2016, the ME implemented a staff-restructuring plan in response to the combining of both the Asia and Africa Innovation Labs. Dr. Patrick Webb became overall Program Director. New staff additions included a Regional Manager for Asia since activities in Nepal increased, the research in Bangladesh launched and designs for similar research in Cambodia were underway. Two Junior Researchers were added to oversee and implement the new and expanded projects in Nepal and Uganda. Increased funding was dedicated to further lab analysis on aflatoxin investigation and new funding was provided to Boston Children's Hospital to support a postdoctoral. The Nutrition Innovation Lab has pursued in-country registration in Nepal and Uganda and office set up in Kathmandu. The office, now managed by the ME, houses all of the research projects, including the team from Johns Hopkins, which has proved extremely efficient. Funds have been earmarked for a series of publications in FNB.

XI) Other Topics (Impact Assessment, Gender Initiatives)

Not applicable

XII) Issues and How They are Being Addressed (Financial, Management, Regulatory)

In FY 2016, the ME directed more than 50% of the funding toward research in Nepal and Uganda. The core awards continue to support the aflatoxin investigation as well as preliminary work designs and discussions in Cambodia. Time was also committed to preparing multiple-concept designs for developing research in Mozambique. In addition, this year's budget fully supported a third panel study in Uganda. There were multiple trips to Washington, DC made mostly by the Program Director as he was invited by USAID to participate in a number of FTF activities. A somewhat unexpected action was taken over the past year, ending the longitudinal birth cohort study. The costs for the study in-country were increasing each year and this increase, given all the other activities to support, could not be sustained. However, the ME has stated to the USAID Mission staff in Uganda that we would seriously consider funding a snapshot investigation of children beyond six months of age to take place in the next year as funding permits.

XIII) Future Directions

In FY 2016, several initiatives were started, including the USAID-supported AAMA revisit study and the Cambodia research. While these were delayed, we will be rolling these out in the first half of FY 2017. The Nepal PoSHAN studies will not conduct another panel in FY 2017 but rather will focus on analyzing existing data which will allow for fine-tuning the questions for FY 2018 panel surveys. Work will continue on analyzing the panel data from Uganda and potentially examine the possibility of integrating the Nepal and Uganda datasets. We will also work toward analyzing the aflatoxin levels in the Ugandan samples. The priority in FY 2017 across all the current activities is to accelerate data analysis and utilize conferences such as Experimental Biology, the International Conference on Nutrition and other opportunities to present findings. The Nutrition Innovation Lab ME continued working with USAID Missions in Mozambique and Malawi on finalizing concept notes for two different activities. Currently, discussions are underway on the proposed activities in Mozambique and Malawi. While the Mission in Guatemala does not have the resources to support the proposed activities at this time, the Mission has suggested revisiting this in FY 2017.

Appendix 1: List of Awards to US universities

1. *Johns Hopkins University*: PoSHAN Community Research (includes local partners, Institute of Medicine, Nepal Agriculture Research Council, New Era and Nepali Technical Assistance Group). Year 6 Total; $575,000; Years 2010-2016 Total; $3,545,653
2. *Harvard University:* (includes local partner Institute of Medicine), Mother-Infant Pair Follow-Up. Year 6 Total: $50,000; Years 2010-2016 Total: $1,171,134
3. *Purdue University:* Understand and measure the connections between agricultural capacity, technology adoption, nutrition outcomes and conditioning factors at levels of aggregation ranging from household to district level. Year 6 Total: $50,000; Years 2010-2016 Total: $876,215
4. *Tuskegee University:* Year 6 Total: $30,000; Years 2010-2016 Total: $450,706.

Appendix 2: List of Presentations Made on Nutrition Innovation Lab Research Activities FY2016

Number	Region	Type	Name of Presenter	Meeting	Location	Title	Date	Attendees
1	Africa	Oral	Barnabas Natamba, JS Wang, SL Young, Shibani Ghosh, JK Griffiths	Experimental Biology 2016	San Diego, USA	Perinatal Exposure to Aflatoxins is Associated with Reduced Rate of Gestational Weight Gain in HIV-Infected Women, and Linear Growth in Their 1-to-12-Month Old HIV-Exposed Infants	Apr-16	200
2	Africa	Oral	Barnabas Natamba, JS Wang, SL Young, Shibani Ghosh, JK Griffiths	Experimental Biology 2017	San Diego, USA	Pregnant and Lactating Women Have Higher Serum Aflatoxins Than HIV–Uninfected Women and Aflatoxin Levels among HIV-Infected Women are Higher During Early Lactation Than During Pregnancy	Apr-16	200
3	Africa	Oral	Barnabas Natamba, Saurabh Mehta, F Vermeylen, Elizabeth Widen, Shibani Ghosh, JK Griffiths	Experimental Biology 2018	San Diego, USA	Cross-Sectional but not Longitudinal Measures of Food Insecurity are Associated with the Rate of Weight Gain During Pregnancy in Northern Uganda	Apr-16	200
4	Africa	Oral	Florence Kinyata, Bernard Bashaasha	Community Connector	Kampala, Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Oct-15	8
5	Africa	Oral	Florence Kinyata, Bernard Bashaasha	Africa Day for Food and Nutrition Security	Kampala, Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Oct-15	600
6	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Field Training Workshop	Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Dec-15	28
7	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Field Training Workshop	South-western Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Nov-15	27
8	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Rukungiri Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Jul-Aug-16	62

9	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Kanungu Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	43
10	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Kabale Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	65
11	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Lira Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	63
12	Africa	Oral	Bernard Bashaasha, Florence Kinyata and Annet Kawuma	Apac Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	49
13	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Kole Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	56
14	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Nebbi Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	48
15	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Atyakc Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	50
16	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Pader Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	39
17	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Lamwo Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	34
18	Africa	Oral	Bernard Bashaasha, Florence Kinyata, Annet Kawuma	Kamwenge Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	80

19	Africa	Oral	Bernard Bashaasha, Florence Kinyata and Annet Kawuma	Kabarole Dissemination Workshop	South-western & Northern Uganda	Effectiveness of Integrated Agriculture, Health Livelihood and Nutrition Interventions to Improve Maternal and Child Nutrition and Health in Rural Uganda: A Birth Cohort Study	Sept-16	52
20	Africa	Oral	Jeffrey Griffiths	Nutrition & Global Health Seminar Series	Harvard TH Chan School of Public Health	Unexpected Linkages: Cattle, Child Nutrition, and Malaria in Uganda	Mar-16	25
21	Africa	Oral	Elizabeth Asiimwe	Viva voce	Kampala, Uganda	Effect of Nutrition-Sensitive Agricultural Extension Program on Nutrition Knowledge and Dietary Practices of Farming Households in Mukono District, Central Uganda	Apr-16	20
22	Africa	Oral	George Omiat, Gerald Shively	International Conference of the AAAE	Addis Ababa, Ethiopia	Charting the Cost of a Nutritionally-Adequate Diet in Uganda, 2000-2011	Sep-16	17
23	Africa	Oral	Will Masters, Shibani Ghosh	Agriculture, Nutrition & Health Academy	Addis Ababa, Ethiopia	Learning Lab Indicators of Food Insecurity and Malnutrition	Jun-16	150
24	Africa	Oral	Will Masters	AAEA panel	Little Rock, Arkansas	Agricultural Transformation and Human Nutrition in Africa: What has changed?	Aug-16	20
25	Asia	Oral	Patrick Webb	Institute of Medicine seminar	Kathmandu, Nepal	Nutrition-Specific and Nutrition-Sensitive Interventions: Implications for Programming in Nepal	Oct-15	16
26	Asia	Oral	Patrick Webb	USAID presentation: TAG meeting	Dhaka, Bangladesh	Aquaculture and Horticulture Programs: Impacts of Single vs. Multiple Interventions in Bangladesh	Jan-16	20
27	Asia	Oral	E Mitcham, S Gurung, A Deltsidis, A Mukherjee, R Islam	USAID presentation: TAG meeting	Dhaka, Bangladesh	Aquaculture-Horticulture for Nutrition Project: Update with Technical Advisory Group	Jan-16	20
28	Asia	Oral	Patrick Webb	USAID presentation: TAG meeting	Dhaka, Bangladesh	Aquaculture and Horticulture Programs: Impact of Single Versus Multiple Interventions in Bangladesh (Early Preliminary Findings)	Mar-16	15
29	Asia	Oral	Angelos Deltsidis	USAID presentation: TAG meeting	Dhaka, Bangladesh	Updates of Horticulture Innovation Lab Component for Bangladesh Aquaculture-Horticulture for Nutrition Collaborative Research Program	Mar-16	16

30	Asia	Oral	EJ Mitcham, A Deltsidis, A Mukherjee, R Islam	2nd Technical Advisory Group meeting	Dhaka, Bangladesh	Aquaculture-Horticulture for Nutrition Project Updates	Jan-16	500
31	Asia	Oral	EJ Mitcham, A Deltsidis, A Mukherjee, R Islam	3rd Technical Advisory Group meeting	Dhaka, Bangladesh	Aquaculture-Horticulture for Nutrition Project Updates	Mar-16	30
32	Asia	Oral	Sudeep Shrestha	International Conference on Maternal and Child Nutrition, Sri Lanka	Colombo, Sri Lanka	Linking Agriculture, Food Security, Diet and Nutrition in Nepal: Insights from the USAID Nutrition Innovation Lab	Nov-15	60
33	Asia	Oral	Ashish Pokharel	USAID presentation: Monitoring visit to Nepalgunj	Nepalgunj, Nepal	Aflacohort Study Field Operations and Accomplishments	Aug-16	19
34	Asia	Oral	Johanna Andrews-Trevino	Experimental Biology	Boston	"Molds Attack Rice-But We Don't Know What to Do." A Qualitative Study of Farming Families' Perceptions of Food Safety in Banke, Nepal	Apr-16	40
35	Asia	Oral	Keith West	JHSPH Nutrition Seminar	Baltimore	Trekking from Agriculture to Nutrition, One Step at a Time: The Nutrition Innovation Lab in Nepal	Oct-15	50
36	Asia	Oral	Keith West	JHSPH Nutrition Seminar	Baltimore	National Agriculture-to-Nutrition Surveillance in Nepal: Nutrition, Diet, and Home Food Production	Sep-16	40
37	Asia	Oral	Jessica Fanzo	4th Annual Scientific Symposium	Kathmandu, Nepal	Sustainable Diets: Health, Social, Environmental, and Political Dimensions for Nepal	Jul-16	340
38	Asia	Oral	Kenda Cunningham	4th Annual Scientific Symposium	Kathmandu, Nepal	Multi-Sectoral Programs Can Both Improve Health and Nutrition and Address Inequities: Lessons Learned from Suaahara, Nepal	Jul-16	340
39	Asia	Oral	Bhim Kumari Pun	4th Annual Scientific Symposium	Kathmandu, Nepal	Reaching Disadvantaged Groups through Their Peers to Improve Health and Nutrition Behaviors in Three Districts of Nepal	Jul-16	340
40	Asia	Oral	Gogi Grewal	4th Annual Scientific Symposium	Kathmandu, Nepal	Impact Evaluation of “Sunaula Hazar Din” Community Action for Nutrition Project: Midline Results	Jul-16	340

41	Asia	Oral	Ganesh Thapa, Gerald Shively	4th Annual Scientific Symposium	Kathmandu, Nepal	Effects of Transportation Development on Child Nutrition in Nepal	Jul-16	340
42	Asia	Oral	Andrew Thorne-Lyman	4th Annual Scientific Symposium	Kathmandu, Nepal	Household Food Insecurity as a Predictor of Child Development in Peri-Urban Nepal: A Cross-Sectional Analysis	Jul-16	340
43	Asia	Oral	Sanjay Rijal	4th Annual Scientific Symposium	Kathmandu, Nepal	The Improvement in Nutritional Status among Under-5 Children in Karnali: Evidence from Linking Infant and Young Child Feeding with Child Cash Grants	Jul-16	340
44	Asia	Oral	Pradiumna Dahal	4th Annual Scientific Symposium	Kathmandu, Nepal	A Journey to MSNP in Nepal: Its Evolution, Processes and the Way Forward.	Jul-16	340
45	Asia	Oral	Patrick Webb	4th Annual Scientific Symposium	Kathmandu, Nepal	Measuring Nutrition Governance in Nepal: A Multilayer Assessment of Institutional and Individual Capacities and Commitment at National, Regional and Local Levels	Jul-16	340
46	Asia	Oral	Savita Malla	4th Annual Scientific Symposium	Kathmandu, Nepal	Advocacy and Communication Strategies for Increasing Engagement of Sectors and Stakeholders	Jul-16	340
47	Asia	Oral	Madhukar Shrestha	4th Annual Scientific Symposium	Kathmandu, Nepal	The Influence of the MSNP on Planning and Financing for Nutrition	Jul-16	340
48	Asia	Oral	Kenda Cunningham	4th Annual Scientific Symposium	Kathmandu, Nepal	Stories of Change: 20 Years of Nutrition Progress in Nepal	Jul-16	340
49	Asia	Oral	Bishnu Dulal	4th Annual Scientific Symposium	Kathmandu, Nepal	The Association between Homestead Food Production Diversity of Diets among Women and Children	Jul-16	340
50	Asia	Oral	Keith West	4th Annual Scientific Symposium	Kathmandu, Nepal	Home Food Production Buffers against a Diet of Impoverishment in Rural Nepal (PoSHAN)	Jul-16	340
51	Asia	Oral	Ahmed Kablan	4th Annual Scientific Symposium	Kathmandu, Nepal	Food Safety Concerns in Feed the Future	Jul-16	340
52	Asia	Oral	Johanna Andrews-Trevino	4th Annual Scientific Symposium	Kathmandu, Nepal	"Molds Attack Rice-But We Don't Know What to Do." A Qualitative Study of Farming Families' Perceptions of Food Safety in Banke, Nepal	Jul-16	340

53	Asia	Oral	Shibani Ghosh	4th Annual Scientific Symposium	Kathmandu, Nepal	Factors Associated with Serum Aflatoxin Levels in Pregnant Women in Banke District, Nepal	Jul-16	340
54	Asia	Oral	YB Thapa	4th Annual Scientific Symposium	Kathmandu, Nepal	Approaches for Improving Food and Nutrition Security: Vision of Agriculture Development Strategy (2016-35), Nepal	Jul-16	340
55	Asia	Oral	Damodar Kanel	4th Annual Scientific Symposium	Kathmandu, Nepal	Application of a Crop Yield Forecasting Tool for Cereal Crop Production in Nepal to Strengthen Early Warning and Planning for Agriculture and Food Security	Jul-16	340
56	Asia	Oral	Sunila Rai	4th Annual Scientific Symposium	Kathmandu, Nepal	Periphyton Enhanced System to Increase Yield in Polyculture Ponds with Carp and Small Indigenous Species	Jul-16	340
57	Asia	Oral	Laurie Miller	4th Annual Scientific Symposium	Kathmandu, Nepal	Educational Level of Women Participants in a Community Development Intervention Relates to Changes in Socio-Economic Status, Household Hygiene Practices and Child Nutritional Status	Jul-16	340
58	Asia	Oral	Rolf Klemm	4th Annual Scientific Symposium	Kathmandu, Nepal	The Quality of a Woman's Diet is Associated with Household Food Insecurity in Rural Nepal (PoSHAN)	Jul-16	340
59	Asia	Oral	Devendra Gauchan	4th Annual Scientific Symposium	Kathmandu, Nepal	The Role of Home Gardens in On-Farm Biodiversity, Household Production and Consumption of Nutrient-Rich Vegetables and Fruits	Jul-16	340
60	Asia	Oral	Rupa Shiwakoti	4th Annual Scientific Symposium	Kathmandu, Nepal	Women's Empowerment and Nutritional Status of Children: A Community-Based Study from Bhaktapur District, Nepal	Jul-16	340
61	Asia	Oral	Charulatha Banerjee	4th Annual Scientific Symposium	Kathmandu, Nepal	Knowledge Management to Support Scaling Up Nutrition	Jul-16	340
62	Asia	Oral	Ahmed Mushtaque	4th Annual Scientific Symposium	Kathmandu, Nepal	BRAC Approach to Tackling Ultra Poverty	Jul-16	340
63	Asia	Poster	Shibani Ghosh, Johanna Andrews Chavez, KC Anushree	4th Annual Scientific Symposium	Kathmandu, Nepal	Anemia Status in Pregnant Women in Banke, Nepal	Jul-16	340

64	Asia	Poster	Shibani Ghosh, Johanna Andrews Chavez, Ashish Pokharel	4th Annual Scientific Symposium	Kathmandu, Nepal	Factors Linked to Low-Mid-Upper-Arm Circumference in Pregnant Women in Banke, Nepal	Jul-16	340
65	Asia	Poster	Manjeswori Ulak, Tor Strand, Andrew Thorne-Lyman, et al.	4th Annual Scientific Symposium	Kathmandu, Nepal	Prevalence of Vitamin A Deficiency among Lactating Mothers and Infants in Bhaktapur, Nepal	Jul-16	340
66	Asia	Poster	Andrew Thorne-Lyman, M Shrestha, Tor Strand, et al.	4th Annual Scientific Symposium	Kathmandu, Nepal	Testing of a Field-Friendly Method to Measure the Potential Impact of Food Security and Nutritional Interventions on Child Development in Banke, Nepal	Jul-16	340
67	Global	Oral	Gerald Shively	Online AG discussion	online-Agrilinks	Ask AG Interactions Between Climate Change & Nutrition	Nov-15	54
68	Global	Oral	Will Masters	Agriculture-Nutrition Seminar	Rutgers University	Nutrition Transition and Agricultural Transformation: A Preston Curve Approach	Oct-15	45
69	Global	Oral	Will Masters	BIFAD Side event at World Food Prize Borlaug Dialogue	Des Moines, IA	The Global Pattern of Malnutrition: From undernutrition to obesity and diet-related disease	Oct-15	25
70	Global	Oral	Will Masters	Technical Workshop on SDG2	Rome	New Metrics for the Evaluation of SDG2: Insights from the FSIN Technical Working Group on Measuring food and Nutrition Security	Nov-15	680
71	Global	Oral	Will Masters	Harvard Weatherhead Seminar	Boston	The Big Picture for Global Hunger: Transitions in Agriculture, Public Policy, and Nutrition	Feb-16	25
72	Global	Oral	Will Masters	Friedman seminar on premixed complemen-tary foods	Boston	Got Baby Food? Understanding the Market for Packaged Complementary Foods in Developing Countries	Feb-16	80
73	Global	Oral	Will Masters	Tufts Research Day	Boston, USA	From Food Quantity to Diet Quality: How the Race Against Malthus is Changing	Apr-16	30

Appendix 3: Papers Published During Fiscal Year 2016[9]

1. Chandyo RK, Henjum S, Ulak M, Thorne-Lyman A, Ulvik R, Shrestha P, Locks L, et al. 2015. *The prevalence of anemia and iron deficiency is more common in breastfed infants than their mothers in Bhaktapur, Nepal.* European Journal of Clinical Nutrition. DOI: 10.1038/ejcn.2015.199.

2. Green R, Sutherland J, Dangour A, Shankar B, Webb P. 2016. *Global dietary quality, undernutrition and non-communicable disease: a longitudinal modelling study*. BMJ Open 2016; 6: e009331. DOI:10.1136/bmjopen-2015-009331

3. Miller L, Joshi N, Lohani M, Singh R, Bhatta N, Rogers B, Griffiths J, et al. 2016. *Head Growth of undernourished children in rural Nepal: Association with demographics, health, and diet.* Paediatrics and International Child Health. ISSN: 2046-9047 (Print) 2046-9055 (Online). http://dx.doi.org/10.1080/20469047.2015.1133517

4. Ulak M, Chandyo R, Thorne-Lyman A, Henjum S, Ueland P, Midttun O, Shrestha P, et al. T. 2016. *Vitamin Status among Breastfed Infants in Bhaktapur, Nepal.* Nutrients 2016, 8(3), 149. DOI: 10.3390/nu8030149

5. Thilsted SH, Thorne-Lyman A, Webb P, Bogard JR, Subasinghe R, Phillips MJ, Allison EH. 2016. *Sustaining healthy diets: The role of capture fisheries and aquaculture for improving nutrition in the post-2015 era.* Food Policy, vol. 61, May 2016, pg 126-131. DOI:10.1016/j.foodpol.2016.02.005 http://www.sciencedirect.com/science/article/pii/S030691921630001X

6. Darrouzet-Nardi A, Miller LC, Joshi N, Mahato S, Lohani M, Rogers BL. 2016. *Child dietary quality in rural Nepal: Effectiveness of a community-level development intervention.* Food Policy, vol. 61, May 2016, pg 185-197. DOI:10.1016/j.foodpol.2016.03.007

7. Natamba B, Mehta S, Achan J, Stoltzfus R, Griffiths J, Young S. 2016. *The association between food insecurity and depressive symptoms severity among pregnant women differs by social support category: a cross-sectional study*. Maternal & Child Nutrition. DOI: 10.1111/mcn.12351. http://onlinelibrary.wiley.com/doi/10.1111/mcn.12351/abstract

8. Miller L, Joshi N, Lohani M, Rogers B, Kershaw M, Houser R, Ghosh S, et al. 2016. *Duration of programme exposure is associated with improved outcomes in nutrition and health: the case for longer project cycles from intervention experience in rural Nepal.* Journal of Development Effectiveness. DOI: 10.1080/19439342.2016.1231706. http://dx.doi.org/10.1080/19439342.2016.1231706

9. Ackatia-Armah NM, Addy NA, Ghosh S, Dube L. *Fostering reflective trust between mothers and community health nurses to improve the effectiveness of health and nutrition efforts: An ethnographic study in Ghana, West Africa.* Social Science & Medicine, vol. 158, June 2016, pg 96-104

10. Miller LC, Joshi N, Lohana M, Singh R, Bhatta N, Rogers B, Griffiths JK, Ghosh S, Mahato S, Singh P and Webb P. 2016. *Head growth of undernourished children in rural Nepal: Association*

[9] These publications and abstracts are cumulative from the Innovation Lab's Semi-Annual report, with the exception of a few.

with demographics, health and diet. Paediatrics and International Child Health. http://dx.doi.org/10.1080/20469047.2015.1133517

11. Ghosh S. 2016. *Protein Quality in the First Thousand days of life.* Food and Nutrition Bulletin. Mar; 37 Suppl 1:S14-21. DOI: 10.1177/0379572116629259

12. Biehl E, Klemm R, Manohar S, Webb P, Gauchan D, West K. 2016. *What Does It Cost to Improve Household Diets in Nepal? Using the Cost of the Diet Method to Model Lowest Cost Dietary Changes.* Food and Nutrition Bulletin. DOI: 10.1177/0379572116657267

13. Masters W, Colaiezzi B, Dennison K, Hill J, Jordan-Bell E, Kablan A, Thurber M, et al. 2016. *Agricultural policy for improved nutrition in Africa and Asia: evidence to guide the US Government's investments in food security.* Food Security. vol. 7, issue 3, June 2015, pg 747-750, DOI: 10.1007/s12571-015-0444-y. http://link.springer.com/article/10.1007/s12571-015-0444-y

14. Darrouzet-Nardi, AF and Masters, WA. 2016. *Urbanization, market development and malnutrition in farm households: evidence from the Demographic and Health Surveys, 1986–2011.* Food Security. DOI: 10.1007/s12571-015-0470-9. http://link.springer.com/article/10.1007/s12571-015-0470-9

15. Masters WA. 2016. *Chapter 2.2 The Economic Causes of Malnutrition.* Good Nutrition: Perspectives for the 21st Century. Karger.

16. Lele W, Masters WA, Kinabo J, Meenakshi JV, Ramaswami B, Tagwireyi J, et al. 2016. *Measuring Food and Nutrition Security: An Independent Technical Assessment and User's Guide for Existing Indicators.* Food Security Information Network. http://www.fao.org/fileadmin/user_upload/fsin/docs/1_FSIN-TWG_UsersGuide_12June2016.compressed.pdf

17. Ghosh S, Namirembe G, Moaz M, Pokharel A, Marino-Costello E, Griffiths JK and Webb P. *Relationship of Stunting and Overweight in Egyptian children under five years of age: Trends and associated risk factors.* Report to USAID Egypt.

Abstracts

1. Natamba B, Mehta S, Vermeylen F, Widen EM, Ghosh S, Griffiths JK, et al. 2016. *Cross-sectional but not Longitudinal Measures of Food Insecurity are Associated with the Rate of Weight Gain during Pregnancy in Northern Uganda.* FASEB Journal 30:899.10.

2. Natamba B, Vermeylen F, Young SL, Griffiths JK, Brannon PM, Mehta S. 2016. *HIV infection is associated with a lower rate of gestational weight gain and reduced neonatal length.* FASEB Journal 30:lb399.

3. Natamba B, Wang JS, Young SL, Ghosh S, Griffiths JK. 2016. *HIV-Infected Pregnant and Lactating Women have Higher Serum Aflatoxin levels than HIV–Uninfected Women and Aflatoxin Levels are higher during Early Postpartum than during Pregnancy among HIV-Infected Women.* FASEB Journal 30:668.5.

4. Natamba B, Mehta S, Vermeylen F, Stoltzfus RJ, Young SL, Griffiths JK. 2016. *Progression of antepartum depression differs by level of perceived social support and food insecurity.* FASEB Journal 30:lb398.

5. Natamba B, Wang JS, Young SL, Ghosh S, Griffiths JK. 2016. *Perinatal Exposure to Aflatoxins is Associated with a Lower Rate of Weight Gain Among HIV-Infected Pregnant Women and Reduced Linear Growth of HIV-Exposed Infants*. FASEB Journal 30:432.6.

6. Blakstad MM, Mehta S, Kuule J, Natamba B. 2016. *High levels of food insecurity were observed among HIV, TB, and HIV/TB co-infected outpatients in northern Uganda.* FASEB Journal 30.899.12.

7. Natamba B, Mehta S, Mou S, Ghosh S, Stoltzfuz R, Griffiths J, Young S. 2016. *Social Support Modifies Bidirectional Linkages Between Food Insecurity and Prenatal Depressive Symptoms while Domestic Violence Alters the Unidirectional Impact of Food Insecurity on Prenatal Depressive Symptoms.* FASEB Journal 29: 261.8.

8. Widen E, Natamba B, Collins S, Kahn H, Sirotin N, Ghosh S, et al. 2016. *Maternal Food Insecurity is Associated with Loss of Fat, but not Lean Mass during Lactation among Ugandans of Mixed-HIV Status.* FASEB Journal 29: 898.14.

9. Miller L, Joshi N, Lohani M, Rogers B, Mahato S, Griffiths JK, et al. 2016. *Educational level of women participants in a community development intervention relates to changes in socio-economic status, household hygiene practices, and child nutritional status.* Submitted and Presented at the Symposium in Kathmandu, Nepal.

10. Darrouzet-Nardi AF, Miller L, Joshi N, Mahato S, Lohani M, Drozdowsky J, Rogers B. 2016. *Longitudinal analysis of the intrahousehold distribution of foods in rural Nepal: Effectiveness of a community-level development intervention.* Submitted and presented to the AAEA in Boston.

11. Natamba BK, Wang JS, Young SL, Ghosh S, Griffiths JK. *Perinatal exposure to aflatoxins is associated with reduced rate of gestational weight gain in HIV infected women, and linear growth in their 1-to-12 month old HIV exposed infants*. Oral presentation at Experimental Biology 2016.

12. Natamba B, Wang JS, Young S, Ghosh S and Griffiths JK. *HIV-Infected Pregnant and Lactating Women have Higher Serum Aflatoxins than HIV–Uninfected Women and Aflatoxin Levels among HIV-Infected Women are Higher during Early Lactation than during Pregnancy*. Oral Presentation at Experimental Biology 2016.

13. Natamba B, Mehta S, Vermeylen F, Widen EM, Ghosh S and Griffiths JK. *Cross-sectional but not longitudinal measures of food insecurity are associated with the rate of weight gain during pregnancy in northern Uganda.* Submitted to Experimental Biology 2016.