



FEED THE FUTURE

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



Innovation Lab for Nutrition- Asia Annual Report October 1st, 2014- September 30th, 2015

Lessons learned from programs
in Nepal that integrate
agriculture and nutrition actions

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Feed the Future Innovation Lab
for Nutrition-Asia

U.S. Government Partners



Partners in Nepal



Feed the Future Innovation Lab for Nutrition-Asia

Annual Report Fiscal Year 2014-2015 (Year 5)

Management Entity Information

Tufts University's Friedman School of Nutrition Science and Policy is the Management Entity for the Feed the Future Innovation Lab for Nutrition-Asia (hereafter called the Nutrition Innovation Lab-Asia). Its activities are funded under cooperative agreement AID-OAA-L-10-00005 from the United States Agency for International Development (USAID).

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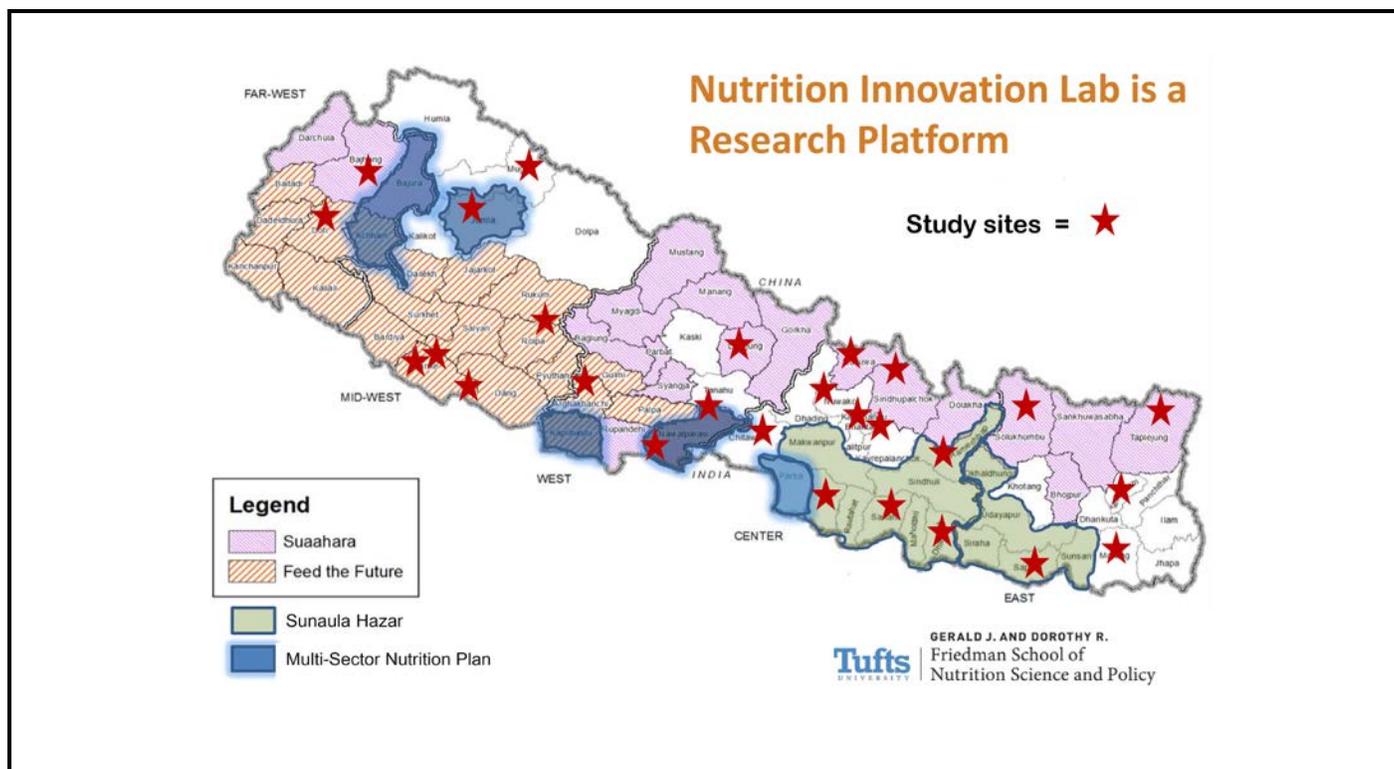
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Man Kumaru Rai	Faculty	Institute of Medicine
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Representative	Government Official	Ministry of Local Development
Representative	Government Official	Ministry of Education
Representative	Government Official	Ministry of Physical Planning
Representative	Government Official	Ministry of Agriculture and Cooperatives
Representative	Government Official	Nepal Health Research Council

* Not to be confused with the Nepal Technical Advisory Group (NTAG), one of the Nutrition Innovation Lab-Asia’s core collaborating partners in Kathmandu.

Map Indicating Nepal Study Sites



This map highlights the locations of a set of interlinked studies that are framed by an overall research protocol¹. First, there are 27 geographic sites that are the focus of: a) community level research undertaken by Johns Hopkins University, with NTAG, the Institute of Medicine, the Nepal Agricultural Research Council; and b) policy process research led by Tufts University with the Patan Academy of Health Sciences (PAHS), Tribhuvan University and Helen Keller International (HKI), in partnership with the Child Health Division (CHD)/Ministry of Health and Population.

Second, complementary studies were implemented in several additional sites during Fiscal Year 2015, including: i) Aflatoxins and nutrition—an Afla Cohort study in the Banke District, led by Tufts in collaboration with HKI, PAHS, CHD and the University of Georgia; ii) Frontline Worker (knowledge and practice) Study in PoSHAN sites plus Suaahara program “expansion districts”—led by Tufts with Valley Research Group, in collaboration with Save the Children; iii) Two studies in the Nawalparasi, Chitwan and Banke Districts led by Heifer/Nepal (in collaboration with NTAG and Tufts) on integrated livestock and community development programming on nutrition; and iv) Testing measures of cognitive development as a metric of nutritional wellbeing in the context of programming—led by Harvard University in collaboration with Heifer/Nepal (in Banke District).

¹ Webb P, et al. (2013) *Research in Asia: Approach, Methods and Protocols*. V.3 November 2013. Nutrition Innovation Lab-Asia, Tufts University, Boston, MA.

List of Program Partners for Nepal

US Partners

- Johns Hopkins University
- Harvard University
- Purdue University
- Tuskegee University
- University of Georgia
- University of California, Davis
- Development Alternatives, Inc. (DAI)
- International Food Policy Research Institute (IFPRI)
- National Aeronautics and Space Agency (NASA)

Nepal-Based Partners

- 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

Other International Partners

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

List of Program Partners for Bangladesh and Cambodia

- Horticulture Innovation Lab (University of California, Davis)
- AquaFish Innovation Lab (Oregon State University)
- WorldFish

Acronyms

- DFAT - Department of Foreign Affairs and Trade (Australian Government)
- BBNC - Bangalore-Boston Nutrition Collaborative
- BIFAD - Bureau for International Food, Agriculture and Development
- DAI - Development Alternatives Inc.
- FTF - Feed the Future
- GAIN - Global Alliance for Improved Nutrition
- HKI - Helen Keller International
- IFPRI - International Food Policy Research Institute
- IOM - Institute of Medicine (Nepal)
- LCIRAH- Leverhulme Centre for Integrated Research on Agriculture and Health (University College London)
- NGO - Non-governmental agency (or private voluntary organization)
- NASA - National Aeronautics and Space Agency
- NTAG - Nepali Technical Assistance Group
- PAHS - Patan Academy of Health Sciences (Nepal)
- 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 how agriculture can be leveraged to achieve improved nutrition, how multiple sectors of policy and program activity can be more effectively integrated to achieve improvements in maternal and child nutrition at scale, and 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 2015. The review report offered considerable praise for the research and capacity building work undertaken in Asia, and it offered constructive suggestions for enhancements which were quickly incorporated into the Nutrition Innovation Lab-Asia's activities.

During Fiscal Year 2015, the Nutrition Innovation Lab-Asia supported a set of studies in often-challenging contexts in Nepal, while also laying the ground for an expansion of research into other parts of Asia (notably Bangladesh and Cambodia). The Nepal-specific studies faced serious constraints as a result of the earthquake of April 25, 2015 and the political unrest which followed the formal adoption of a new Constitution in September 2015. Both of these led to delay or suspension of field activities which impacted study implementation timelines and survey logistics. Nevertheless, ongoing research continued—albeit at a reduced scale, in the case of the nationally-representative surveys that underpin the Policy and Science for Health, Agriculture and Nutrition (PoSHAN) studies, and new studies were initiated. The new projects include a USAID/Nepal-supported study on aflatoxins and child stunting. In addition, new work was done in assessing frontline workers' capacity to support improved nutrition (in collaboration with USAID's Suaahara Project), and a validation of a suite of measures of cognitive development as a complement to other metrics of nutrition.

A total of 58 presentations were made on Asia-specific research, including an important event in Washington, DC on September 30, 2015, which included 70 people in attendance and 150 online. Five Nepali students were supported in their graduate-level studies (one of whom graduated in Fiscal Year 2015), 370 individuals received short-term skills training (including 123 women and 247 men), and the ME and core partners made a total of 30 presentations on Nutrition Innovation Lab research. Tribhuvan University enrolled a first cohort of 22 students in a new nutrition specialization of the Master's degree in Public Health designed with significant input and guidance from Tufts University; the ME and partners offered several seminars to those students during Fiscal Year 2015. A third Scientific Symposium was held in Nepal in November 2014, with funding from the USAID mission, attracting almost 300 participants. Two workshops were organized on rigor and evidence quality for development policy.

A total of 10 papers were published in Fiscal Year 2015: eight of those were peer-reviewed articles, one was commentary published in the *Lancet*, and one was a Timor-Leste government report based on a nationally-representative nutrition survey and aflatoxin analysis in which the ME played a lead role.

New household surveys are planned in Fiscal Year 2016 in Nepal (full rounds of PoSHAN data collection, as well as a new study to examine the sustained impacts, behaviors and knowledge of homestead gardening projects funded by USAID in 2011/2012). A first round of new data collection is also planned for Bangladesh and Cambodia on aquaculture and horticulture impacts on diets and nutrition, as well as the viability of innovative community-based drying and storage technologies.

II) Program Activities and Highlights

The Nutrition Innovation Lab-Asia's research in Nepal continues to generate impactful findings and wide interest among donor, government and academic partners. Several streams of multiyear research continued, despite the earthquake in April 2015, while new study elements were initiated. Capacity-building activities continued to expand.

Research

The Nutrition Innovation Lab-Asia's rigorous empirical research took many forms during Fiscal Year 2015, including:

- Initiation of a new birth cohort study looking at the impacts on birth outcomes and infant growth/stunting of exposure to aflatoxins through the maternal diet and breast milk.

- Completion of an assessment (in collaboration with USAID’s Suaahara project and IFPRI) of the knowledge, capacity and practices of frontline workers in health, agriculture, social protection, etc. in relation to nutrition problems and interventions.
- Continuation of two streams of multiyear panel surveys: first, the PoSHAN (Policy and Science for Health, Agriculture and Nutrition) community research; and second, PoSHAN policy process research. Both streams of research were impacted by the earthquake. Given the insecurity and logistical difficulties of sending survey teams to directly impacted locations, it was decided to conduct the PoSHAN surveys in only nine of the usual 21 districts (including all seven Terai Districts plus the sentinel sites). Data analysis of earlier rounds of surveys was accelerated in Fiscal Year 2015, with a large set of publications due in Fiscal Year 2016.
- The Heifer/Nepal-led study on livestock interventions, diet quality and nutrition outcomes continued, but added a new facet in collaboration with Harvard. This study successfully tested metrics of cognitive development that could be used in future PoSHAN surveys to assess nutritional compromise beyond anthropometry.
- Planning and preparation for new household panel surveys in Bangladesh and Cambodia on dietary and nutrition impacts of USAID and other programming affecting the supply of aquaculture and horticulture products. Also, assessments of the viability and potential impacts of new drying and storage technologies for such products at the community level.

Capacity Building

The important catalyzing role played by the ME and its partners in promoting science and policy dialogue in Nepal, India and across the region is highlighted by the following activities:

- A third Scientific Symposium was organized in Kathmandu with USAID mission support. The number of participants was roughly double that of the first Symposium organized in 2012.
- Thirty presentations were made by researchers involved in the Nutrition Innovation Lab-Asia’s activities, reaching an aggregate audience in Fiscal Year 2015 of approximately 2,400 people.
- Two special workshops were organized for Nepali researchers, teachers and students on rigor and evidence quality for development policy. They included presentations by world-class scientists and policymakers from Johns Hopkins University and Tufts University as well as the London School of Hygiene and Tropical Medicine.
- 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. The ME and core partners made several seminar presentations to those students during Fiscal Year 2015.

III) Key Accomplishments (Fiscal Year 2015)

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

i) Policy-relevant research outputs:

- *Dissemination of research findings.* During Fiscal Year 2015, Nutrition Innovation Lab-Asia collaborators (including local partners) made **42 individual presentations** in a range of impactful venues that are summarized in Appendix 2. Many were presentations co-authored with, and sometimes made by, Nepali colleagues; others were individual efforts by the ME, US partners as well as Nepali partners. The total (aggregate) audience participating in these presentations was approximately **2,400 people**—individuals directly exposed to new thinking and findings generated by Nutrition Innovation Lab-Asia activities.
- *Dissemination of district-specific results of the PoSHAN policy process research.* The ME prepared a second set of **21 “feedback briefs”** on findings from the Fiscal Year 2014 survey round for distribution to each district concerned. A national policymaker seminar was also organized in Kathmandu in April 2015 to present national findings and to discuss implications for the roll-out of the national Multi-Sector Nutrition Plan.
- *Publications and reports.* **Ten papers** were published/released during Fiscal Year 2015 (Appendix 3). The majority of these include developing country partners and co-authors.

ii) Students educated at a graduate degree level:

- **Five** Nepali students were supported in graduate studies relevant to an enhanced professionally-relevant understanding of agriculture and nutrition (two women and three men); one of them graduated this year, so four continue to receive various forms and levels of support.
- **370 individuals** (123 women and 247 men) obtained short-term training in various forms, through workshops associated with the Scientific Symposium, the intensive Bangalore training, and professional training in survey implementation.

iii) Institutional capacity development:

- As planned, **eight 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 re-training 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; and viii) the Patan Academy of Health Sciences (through partnership in the PoSHAN policy research and establishment of the Afla Cohort study).
- A **Third Scientific Symposium** was organized in Kathmandu in November 2014, funded by USAID/Nepal. Almost **300 participants** attended, compared with 150 in the first Symposium.
- In addition, the ME organized two technical workshops for researchers and students on the theme of "what constitutes rigorous evidence to support policymaking and program design?" This was attended by roughly **40 Nepal-based faculty, researchers, students, donor agency and government analysts.**

IV) Research Program Overview and Structure

The Nutrition Innovation Lab-Asia represents a research platform which provides numerous opportunities for cutting-edge research on agriculture, diets and nutrition in developing countries. In line with findings of the 2012 report from the Board for International Food and Agriculture Development (BIFAD)², the Nutrition Innovation Lab-Asia leverages the exceptional capacity of the US research community by conducting research on priority questions in a "collaborative, interdisciplinary and development-focused" manner. Such research has an applied focus (operations or "delivery science" research rather than "bench science"), it is country-owned (supporting research that 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 that 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-Asia 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 large-scale programs and policies be enhanced to support nutrition-specific and nutrition-sensitive actions?; and 3) What role is played in nutrition by biological mechanisms that 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 for the Nutrition Innovation Lab for Asia (as well as that for Africa, which allows for intellectual synergies and cost-savings to both programs). The Friedman School implements the program of work in partnership with several US university partners—Tufts, Purdue, Johns Hopkins, and Harvard—as well as Development Alternatives Inc. (DAI).

Additional US universities and research entities (University of Georgia, University of California-Davis, Oregon State University and Columbia, as well as the International Food Policy Research Institute), European universities

² BIFAD (2012). *BIFAD Review of the Collaborative Research Support Program (CRSP) Model*. A Report Commissioned By BIFAD at the Request of USAID. August 2012. Washington, DC, Mimeo.

(Bergen in Norway and the London School of Hygiene and Tropical Medicine), and developing-country universities (Tribhuvan University, Patan Academy of Health Sciences, St. John's Research Institute in Bangalore, and the University of Indonesia-Jakarta) 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, Heifer/Nepal, Helen Keller International, Save the Children, and WorldFish.

V) Research Project Reports

a) Empirically explaining agriculture-to-nutrition pathways (PoSHAN Community Research)

i) *Understanding the mechanisms by which agriculture impacts nutrition, and how such mechanisms can be enhanced through multisector interventions.* A panel of approximately 4,300 households (including 5,400 children under five years of age and 4,500 mothers) is being 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:* In light of the earthquake, the ME and its partners were permitted by USAID to reallocate staff time to support the relief effort by engaging with the government in the planning for, and execution of, relief needs assessments. The technical skills of Nutrition Innovation Lab-Asia staff and collaborators were much in demand.

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. This was rectified by the ME in mid-Fiscal Year 2015 so that analyses underway will lead to numerous publications in Fiscal Year 2016.

vi) *Presentations and Publications:* Several dozen presentations were made in Fiscal Year 2015 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 Fiscal Year 2015, which will lead to numerous peer-reviewed publications, co-authored with many different Nepali collaborators, in Fiscal Year 2016.

b) PoSHAN Policy Process Research

i) *Measuring the quality of nutrition governance.* 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 2015, a third round of surveys was initiated (using electronic data capture) in the same nine of 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 third round was still not complete by the end of Fiscal Year 2015 due to politically-motivated unrest in several terai districts. As a result, the third round is planned to be completed by the end of the 2015 calendar year.

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

iii) *Achievements:* It has been shown to be feasible to conduct structured, tablet-based surveys with policymakers at various levels of responsibility in multiple-line ministries. Demand for the district-specific feedback briefs has been strong.

iv) *Capacity building:* Feedback briefs were prepared for each of the 21 districts surveyed in Fiscal Year 2014 and these have been distributed to policymakers and other interlocutors in each district, as well as with national policymakers.

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.

vi) *Presentations and Publications*: Presentations were made on early policy findings by the ME in Nepal at the third Scientific Symposium as well as at a special seminar hosted by the Child Health Division in April 2015. A presentation was made to USAID in Washington, DC on May 7, 2015, in collaboration with SPRING. Publications are in preparation for submission to peer-reviewed journals in Fiscal Year 2016, including a joint publication with SPRING collaborators.

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 Fiscal Year 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 second round of data collection was undertaken early in 2014, and a third round took place in late 2014 despite considerable devastation caused by mudslides linked to heavy rain. Unfortunately, Round 4 had to be cancelled due to the earthquake in April 2015. It was hoped that data collection could be rescheduled for November 2015, but difficult political conditions currently prevail in the Banke District and it is likely that this round will have to be postponed again until the spring of 2016.

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

iii) *Achievements*: Despite considerable difficulty in accessing the study sites due to persistent political unrest in the region, a follow-up survey was conducted in the spring of 2014 by Valley Research Group which included all 960 original households. Those data have been cleaned and analyzed during Fiscal Year 2015, with a view to comparing them with a third round of data.

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 have caused significant delays, but the study has not been compromised—three rounds of empirical data are in hand, and follow-up rounds are planned.

vi) *Presentations and Publications*: Baseline data were analyzed during 2014, leading to several presentations in Boston and Nepal during 2015. No publications yet.

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 that ran from 2009 through 2011. The households reside in communities that 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-Asia supported additional rounds of data collection in Fiscal Year 2013 and Fiscal Year 2014, focusing on discerning impacts on child nutrition and health, diets, and incomes several years post-intervention. The data were extensively analyzed during Fiscal Year 2015 leading to the preparation of six papers—two of which have already been accepted for publication, plus four more to be finalized in Fiscal Year 2016.

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

iii) *Achievements*: Data cleaning was completed; analysis continues; two papers have been accepted for publication (with four in the pipeline) which will help USAID implementing partners better understand realistic timelines for measuring project impacts relating to diets and nutrition.

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; 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 may take more than two years to manifest themselves (measurable).

vi) *Presentations and Publications*: Heifer/Nepal staff made several short presentations of this work at implementing partner meetings during Fiscal Year 2015, as well as at the third Scientific Symposium in Kathmandu. A first paper was published in the *Food & Nutrition Bulletin: Community development and livestock promotion in rural Nepal: Effects on child growth and health*, Vol. 35, No. 3, 2015. A second paper has been accepted for publication in *Paediatrics: Head growth in rural Nepali children*. Four additional papers are being prepared for submission to journals, which are: i) Dietary diversity among rural Nepali children; ii) Food allocation choices, household animal resources, and dietary diversity in rural Nepali households; iii) Household health practices and child growth and health in rural Nepal; and iv) Does women's education determine the effectiveness of a livestock intervention project: impacts on health practices.

e) Econometric analyses of secondary data linking ecology, food systems, and nutrition

i) *Measuring links among environmental factors, agriculture, and nutrition outcomes*. Several 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 Fiscal Year 2015, substantial progress was made in several analytical work streams, including linking data on rainfall and infrastructure (including roads and bridges) to broaden analytical possibilities. In keeping with the goal of making such data available to other members of the Nutrition Innovation Lab research team, a clean analysis-ready dataset was shared with project partners at Tufts who are working on an IFPRI collaboration relating to climate, seasonality and nutrition.

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*: A paper produced by Purdue University using Nepal data was identified in a special issue of the *Journal of Development Studies* as one of the first providers of empirical evidence of links between agriculture and nutrition.

iv) *Capacity building*: Not applicable

v) *Lessons learned*: A collaboration between US academic institutions and NASA can yield powerful data capacity with unique findings on environmental links to child nutrition.

vi) *Presentations and Publications*: Dr. Shively made impactful presentations on these analyses in Kathmandu at the third Scientific Symposium as well as at the September 30 event for USAID in Washington, DC. Two papers were published on this work in Fiscal Year 2015: i) Shively G, Sununtnasuk C, and Brown M. 2015. Environmental Variability and Child Growth in Nepal. *Health and Place*. 35:37-51; and ii) Shively G and Sununtnasuk C. 2015. Agricultural Diversity and Child Stunting in Nepal. *Journal of Development Studies*. 51 (8) 1078-96.

f) Global dietary quality, undernutrition and chronic disease: a longitudinal modeling study

i) *Determining the relationships between global dietary energy availability by food groups and nutrition-related outcomes (child stunting and adult heart disease)*. Using global secondary data, the London School of Hygiene and Tropical Medicine worked with Tufts University to finalize an analysis of correlations among dietary patterns (using FAOSTAT data) and nutrition outcomes (child stunting) and non-communicable diseases (adult ischemic heart disease). The paper was resubmitted to *BMJ Open*, incorporating reviewer comments.

ii) *Collaborators*: London School of Hygiene and Tropical Medicine, University College London, School of Oriental and African Studies, and Tufts University

iii) *Achievements*: A potentially-impactful paper on global dietary patterns and multiple faces of malnutrition has been developed at relatively low cost to USAID.

iv) *Capacity building*: Not applicable

v) *Lessons learned*: This output derives from collaboration among one US and three UK academic institutions. This unusual partnership offers potential for leveraging USAID funds and US-based skills by engagement with UK government funders.

vi) *Presentations and Publications*: A poster and two oral presentations were made at the Experimental Biology conference in April 2015. The oral presentation was made to approximately 350 people in plenary, and to an additional 150 people in a side event.

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*: None

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

VI) Associate Award Research Project Reports

h) Afla Cohort Study–Nepal

i) *What is the relationship between Maternal Exposure to Mycotoxins, Birth Outcomes and Stunting in Infants?* Initiated in Fiscal Year 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 16 VDCs of Banke District will recruit approximately 1,500 pregnant women and follow 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 the considerable logistical challenges posed to establishing cold chain in remote locations of the mid-West, a partnership was established with local hospitals and clinics to allow for blood samples to be processed and stored locally prior to shipment first to Kathmandu and, later, to the US. Hiring of key staff and their training went smoothly, and initial recruitment of 70 pregnant women was achieved before the earthquake. The need for staff to check on their relatives in other parts of the country resulted in a suspension of the study. Subsequent political unrest delayed a planned restart toward the end of Fiscal Year 2015. It is hoped that retraining of staff will occur in early Fiscal Year 2016, with a re-initiation of recruitment by the end of 2015.

iv) *Capacity building*: Local hires have been trained in gold-standard human subjects interactions and partner medical institutions were trained in best practices for the processing and storage of blood samples. Helen Keller International and Valley Research Group staff have been trained in the complexities of research requiring blood and milk sampling.

v) *Lessons learned*: Cold chain can be established in remote parts of Nepal, but solid collaborations are needed with local institutions, and investments are needed in freezer capacity and back-up power to ensure the integrity of blood and milk samples obtained.

vi) *Presentations and Publications*: None to date

i) Bangladesh and Cambodia integrated aquaculture, horticulture and nutrition actions

i) *Are diets and nutrition outcomes improved more where multiple USAID programs 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: a) 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 b) Have programs to increase farmers' incomes resulted in improved nutrition when not coupled with nutrition programming? (USAID 2012). Both questions are being addressed by research which started in Bangladesh in Fiscal Year 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, WorldFish, and Helen Keller International

iii) *Achievements*: In Bangladesh, a longitudinal panel study was designed to follow households across the USAID Bangladesh FTF zone of influence over several years. Following close engagement with IFPRI and other stakeholders, a viable methodology was agreed upon and the protocol was submitted to IRB in-country as well as at Tufts. Survey instruments were successfully programmed in tablets for field-testing and enumerator training, both planned for early in Fiscal Year 2016.

iv) *Capacity building*: None to date

v) *Lessons learned*: The detailed empirical questions being posed by the Nutrition Innovation Lab-Asia in these studies have not been asked 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 that address little-asked questions about consumer preferences, technology adoption, perceptions of food safety, and market price formation.

vi) *Presentations and Publications*: Presentations were made in Dhaka in early 2015 to a group of stakeholders. No publications to date.

VII) Human and Institutional Capacity Development

VII. a) Individual Training–Nepal

Short-Term Trainings: Total 370 (123 female, 247 male)

i) Evidence workshop–Kathmandu, November 2014

- (1) 61 Participants (23 female, 38 male)
- (2) Training in understanding evidence quality/rigor in context of nutrition policymaking
- (3) Mixed: four universities, the Institute of Medicine, Ministries of Health/Agriculture/Planning
- (4) Tufts University, Johns Hopkins University, and London School of Hygiene and Tropical Medicine

ii) Student-focused workshop on presenting evidence via oral and poster sessions–Kathmandu, November 2014

- (1) 39 Participants (16 female, 23 male)
- (2) Training in design and delivery of empirical evidence to make powerful policy points.
- (3) Four Nepali universities
- (4) Tufts University, Johns Hopkins University, Purdue University, Patan Academy of Health Sciences, National Agricultural Research Council, and Tribhuvan University

iii) Bangalore-Boston Nutrition Collaborative—Bangalore, January 2015.

- (1) 65 Participants (24 female, 41 male)
- (2) Training in advanced research methods
- (3) Mixed: all civil society (academic and non-governmental) from India, Nepal, Bangladesh, Uganda and Sri Lanka

(4) St. Johns' Research Institute, Harvard, Tufts University, and Columbia University

iv) PoSHAN community studies training–Kathmandu, May 2015

(1) 11 (1 female, 10 male)

(2) Advanced skills training in rigorous household data collection and quality assurance

(3) New Era and Helen Keller International

(4) Johns Hopkins University

v) 3rd Scientific Symposium–Kathmandu, November 2014

(1) 297 (123 female, 174 male)

(2) Exposure to advanced methods and analytical approaches for determining the nutrition impacts of invests in agriculture, value chains, and multisector programs

(3) Mixed: civil society (academic and non-governmental), government, donor

(4) Johns Hopkins University, NTAG, Helen Keller International, and Purdue University

Longer-Term Trainings: Total 5 (2 female, 3 male)

i) Doctoral studies

(1) Two participants in doctoral programs in the United States (1 female, 1 male)

(2) Nutrition (Food Policy and Applied Nutrition); Agricultural Economics

(3) Not applicable

(4) Tufts University and Purdue University

ii) Master's degree studies

(1) Three participants in Master's degree programs in the United States (1 female, 2 male)

(2) Nutrition (Food Policy and Applied Nutrition)

(3) Not applicable

(4) Tufts University

VII. b) 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.

VIII) 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 that directly impact policy and program design, and the methods of implementing both. The one technology transfer that 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.

IX) Governance and Management Entity Activities

The ME tasks for Fiscal Year 2015 of the program were implemented smoothly by Tufts, despite a certain amount of communications and activity disruption in Nepal associated with the earthquake and political demonstrations. Research and training funds were almost exclusively disbursed among the many partners.

As planned and budgeted for in the Fiscal Year 2015 work plan, the ME was able to restructure the Nutrition Innovation Labs' website, leading to a re-launch in mid-2015. This has been widely viewed and continues to garner praise from other Innovation Labs, users among the professional community, and across Tufts University.

In addition, the Nutrition Innovation Lab-Asia hosted a special event in Kathmandu in November 2014, where packets of Social Science Library electronic materials were formally handed out to more than 14 local academic and research institutions. These packets, which included CDs containing thousands of peer-reviewed articles relating to several social science disciplines of relevance to agriculture, environment, economics and public health, will be made available to the institutions free of charge by Tufts University. Invitations to those institutions were sent out with a 100% positive response rate.

X) Other Topics (impact assessment, gender initiatives)

Not applicable

XI) Issues (financial, management, regulatory)

In Fiscal Year 2015, the ME continued to award more than 60% of the funds to the direct work in Nepal despite the decreased funding in Year 5 as compared to other years. We executed the activities as outlined in the work plan along with the additional recommendation of activities presented in the External Review Report. Specifically, we refurbished our Nutrition Innovation Lab website with the addition of a communications staff person. We added additional student research support in Nepal and added a full-time data analyst to the ME team. There were a number of unbudgeted activities that the ME managed to support this past year, such as the research dissemination event in Washington, DC. We supported our US and international collaborators to participate in this event and held it at the stately Willard Hotel. In addition, we funded activities to promote the event through social media and created materials that will allow viewing post event. Support to examine and prepare a proposal for work in Cambodia along with travel to this country was done through the use of the main core funds. The core award funds have also been used to augment some of the aflatoxin research needs. At the end of Fiscal Year 2015, the ME had exhausted the remaining funds in the core award.

XII) Future Directions

The ME was informed about a five-year extension of the Nutrition Innovation Lab award on September 29, 2015. This good news entails a merging of the separate Asia and Africa labs into a single Nutrition Innovation Lab with Professor Webb as the single Program Director and Professor Ghosh continuing as Associate Director.

During Fiscal Year 2016, a full round of data collection is planned for all 21 study sites in Nepal. The nationally representative datasets from Fiscal Years 2013-2015 will be analyzed to generate a large number of papers and presentations on the links between agricultural productivity, incomes, diets, and nutrition. The findings from the FLW study will be presented at multiple venues and are also being prepared for publication. A study will be initiated on the sustained impacts of the USAID-supported AAMA project that was implemented in Baitadi until 2012. It is also hoped that fieldwork can be initiated in Cambodia, in parallel with work in Bangladesh, on aquaculture, horticulture and nutrition.

Appendix I: 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 5 Total; \$602,000; Years 2010-2015 Total; \$2,801,357.
2. *Harvard University*: (includes local partner Institute of Medicine), Mother-Infant Pair Follow-Up. Year 5 Total: \$72,000; Years 2010-2015 Total: \$477,683.
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 5 Total: \$79,670; Years 2010-2015 Total: \$391,744.
4. *Tuskegee University*: Year 5 Total: \$2,000; Years 2010-2015 Total: \$141,376.

Appendix 2: List of presentations made on Nutrition Innovation Lab-Asia research activities

Presenter	Event	Place	Title	Date	Size of Audience
Patrick Webb	USAID Presentation	Washington, DC	Strengthening Policy Actions and Governance for Nutrition	May 2015	20
Patrick Webb	APPG	London	Valuing Women's Time in Nutrition	Jun 30 2015	50
Green R, Sutherland J, Dangour A, Shankar B, Webb P.	Experimental Biology	Boston, MA, USA	Dietary Quality, Undernutrition and Disease: Global Patterns and Trends over Three Decades	Mar 30 2015	500+ in total; 350+ in plenary talk; 150+ in side panel
Patrick Webb	Understanding Agriculture to Nutrition: A Rapidly Moving Agenda	Washington DC	Mapping Nutrition Innovation Lab Research: How Does It All Fit Together?	Sep 30 2015	120 in person; 150 online
Gerald Shively	Understanding Agriculture to Nutrition: A Rapidly Moving Agenda	Washington DC	Climate, Agriculture, and Nutrition: Tightly Woven or Loosely Meshed?	Sep 30 2015	120 in person; 150 online
Keith West	Understanding Agriculture to Nutrition: A Rapidly Moving Agenda	Washington DC	Influences of Markets and Home Production on Nutritious Food Intake	Sep 30 2015	120 in person; 150 online
Shibani Ghosh	Understanding Agriculture to Nutrition: A Rapidly Moving Agenda	Washington DC	Production Diversity and Women's Dietary Diversity in Nepal	Sep 30 2015	120 in person; 150 online
Robin Shrestha	Understanding Agriculture to Nutrition: A Rapidly Moving Agenda	Washington DC	Relevance of Innovation Lab Research to In-Country Policymaking and Programming in Nepal	Sep 30 2015	120 in person; 150 online

Symposium Presentations	3rd Annual Scientific Symposium	Kathmandu, Nepal		Nov 2014	
Alan Dangour	3rd Annual Scientific Symposium	Kathmandu, Nepal	Time to Move from Agriculture to Action in Agriculture and Health	Nov 2014	294
Akriti Singh	3rd Annual Scientific Symposium	Kathmandu, Nepal	Maternal Access to Information: Can Bhanchhin Aama Influence Child Diets?	Nov 2014	294
Bishow Raman Neupane	3rd Annual Scientific Symposium	Kathmandu, Nepal	Integrating Nutrition in Local Response Structures: An Example from Suaahara	Nov 2014	294
Patrick Webb	3rd Annual Scientific Symposium	Kathmandu, Nepal	Measuring Nutrition Governance in Nepal: Metrics of the Management of Multisectoral Plans	Nov 2014	294
Rolf Klemm	3rd Annual Scientific Symposium	Kathmandu, Nepal	PoSHAN Community Studies, Nepal-Preliminary insights from 2013 and 2014 panel surveys	Nov 2014	294
Keith West	3rd Annual Scientific Symposium	Kathmandu, Nepal	Aflatoxin Exposure During the First 1,000 Days of Life in Rural South Asia Assessed by Aflatoxin-Lysine Albumin Biomarkers	Nov 2014	294
Claire Fitch	3rd Annual Scientific Symposium	Kathmandu, Nepal	Barriers to Collaborative Agriculture and Nutrition Research	Nov 2014	294
Erin Biehl	3rd Annual Scientific Symposium	Kathmandu, Nepal	Challenges to Turning Nutrition & Agricultural Research Findings into Action	Nov 2014	294
Gerald Shively	3rd Annual Scientific Symposium	Kathmandu, Nepal	Food Prices: Their Determinants and Connections to Child Nutrition in Nepal	Nov 2014	294
Laurie Miller	3rd Annual Scientific Symposium	Kathmandu, Nepal	Chile Dietary Quality in Rural Nepal	Nov 2014	294
Keith West	3rd Annual Scientific Symposium	Kathmandu, Nepal	What Constitutes Rigor in Study Design?	Nov 2014	294

Alan Dangour	3rd Annual Scientific Symposium	Kathmandu, Nepal	WASH and Nutrition outcomes in Children.	Nov 2014	294
Patrick Webb	3rd Annual Scientific Symposium	Kathmandu, Nepal	Reviews of Systematic Reviews	Nov 2014	294
Claire Fitch	3rd Annual Scientific Symposium	Kathmandu, Nepal	Is Diversity in Agriculture Production Linked to Dietary Diversity in Among Nepalese Women? Findings from the PoSHAN Community Studies	Nov 2014	294
Erin Biehl	3rd Annual Scientific Symposium	Kathmandu, Nepal	Does Amount and Kind of Food Bought by a Household Vary by Indices of Wealth in Nepal	Nov 2014	294
Neena Joshi	3rd Annual Scientific Symposium	Kathmandu, Nepal	Growth and Health of Rural Children in Three districts of Nepal: Effect of a Community Development Intervention over 48 months	Nov 2014	294
Rina Tiwari	3rd Annual Scientific Symposium	Kathmandu, Nepal	Determinants of Stunting and Severe Stunting among Under-Fives: Evidence from the 2011 Demographic and Health Survey	Nov 2014	294
Jamie Dorsey	3rd Annual Scientific Symposium	Kathmandu, Nepal	Linking Antenatal and Postnatal Care, Maternal Health Knowledge, and Behavior among Women in the PoSHAN Community Studies	Nov 2014	294
Fitch C, Manohar S, Rajbhandary R, Shrestha R, Webb P, Klemm R, West K	3rd Annual Scientific Symposium	Kathmandu, Nepal	Is Diversity in Agricultural Production Linked to Dietary Diversity Among Nepalese Women? Findings from the PoSHAN Community Studies	Nov 2014	200

Appendix 3: Papers published during Fiscal Year 2015

1. Henjum S, Elin Torheim L, Thorne-Lyman A, Chandyo R, Fawzi W, Shrestha P, and Strand T. 2015. Low dietary diversity and micronutrient adequacy among lactating women in a peri-urban area of Nepal. *Public Health Nutrition* 18 (17) 3201-3210 DOI: <http://dx.doi.org/10.1017/S1368980015000671>
2. Webb P, Luo H, and Gentilini U. 2015. Measuring multiple facets of malnutrition simultaneously: the missing link in setting nutrition targets and policymaking. *Food Security* 7 (3) 479-92. DOI: 10.1007/s12571-015-0450-0.
3. Masters W, Colaiezzi B, Dennison K, Hill J, Jordan-Bell E, Kablan A, Thurber M, et al. 2015. Agricultural policy for improved nutrition in Africa and Asia: evidence to guide the US Government's investments in food security. *Food Security*
4. Shively G, Sununtnasuk C, and Brown M. 2015. Environmental Variability and Child Growth in Nepal. *Health and Place*. 35:37-51 [doi:10.1016/j.healthplace.2015.06.008](https://doi.org/10.1016/j.healthplace.2015.06.008)
5. Shively G and Sununtnasuk C. 2015. Agricultural Diversity and Child Stunting in Nepal. *Journal of Development Studies*. 51 (8) 1078-1096. DOI: 10.1080/00220388.2015.1018900.
6. Webb P. 2015. How Strong is Our Evidence of Effective Management of Wasting? A Review of Systematic and Other Reviews. *Food & Nutrition Bulletin* 36 (1) 65S-71S.
7. Tiwari R, Ausman L, and Agho K. 2014. Determinants of Stunting and Severe Stunting among Under-Fives: Evidence from the 2011 Nepal Demographic and Health Survey. *BMC Pediatrics* 14:239. doi:10.1186/1471-2431-14-239
8. Manohar S, Shrestha R, Rajbhandary R, Klemm R, Gauchan D, Adhikari R, Ghosh S, Webb P and West Jr. K. 2015. Risk Factors for Anemia in Non-pregnant Women across the Agroecological Zones of Nepal. *European Jou. Nutrition & Food Safety*, 5(5): 1098-1099. Conference Abstract, DOI: 10.9734/EJNFS/2015/21262.
9. Democratic Republic of Timor-Leste. 2015. Timor-Leste Food and Nutrition Survey (2013). Ministry of Health, Dili. [Government report which included large sections contributed by Tufts University and University of Georgia on aflatoxins and nutrition].
10. Published commentary: Webb P, West K, Jr. and O'Hara C. 2015. Stunting in earthquake-affected districts in Nepal. *Lancet*, 386 (August 1): 430-31.