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

Innovation Lab for Nutrition- Asia

Annual Partner Reports

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

2015

Submitted to: Tufts University–Nutrition Innovation Lab
Submitted by: Helen Keller International-Nepal

Lead University

Founded in 1915 by Helen Keller and George Kessler, Helen Keller International (HKI) is among the oldest international non-governmental organizations (NGOs) devoted to preventing blindness and reducing malnutrition in the world. HKI currently operates in 22 countries, 13 in Africa, eight in the Asia-Pacific, and the United States www.hki.org.

HKI Nepal has been operating in Nepal since 1989, primarily working with national partner organizations. HKI Nepal's current portfolio includes a USAID funded, five year integrated nutrition and health program called *Suaahara* (2011-2016) in collaboration with Save the Children and five other consortium partners. HKI is also a partner with Save the Children and the Community Resilience Program Consortium, on *Sabal* for Livelihood, Nutrition and Disaster Risk Reduction and Climate Change interventions in six districts of the central and eastern hills. Prevention Against Newcastle Disease (PRAN), funded by the Bill and Melinda Gates Foundation and GALVmed, supports a public-private initiative for Newcastle disease vaccination of backyard poultry. A series of studies under *Assessment and Research in Child Feeding* (ARCH) is also funded by the Bill and Melinda Gates Foundation. It is primarily looking at infant and young child feeding practices including product labeling and promotion of breast milk substitutes and commercially produced complimentary foods. In addition, HKI is supporting the USAID-funded SPRING Project for a case study on "Pathways to Better Nutrition" aimed at exploring how the Nepalese Government prioritizes nutrition interventions through the Multi-Sector Nutrition Plan and supports its implementation to achieve the national goals for reducing undernutrition in the country.

Currently, HKI is engaged in three research studies funded by USAID and managed by Tufts University for the Feed the Future Nutrition Innovation Lab. The Policy and Science for Health, Agriculture, and Nutrition (PoSHAN) research draws on national policies and large-scale multi-sectoral programs currently underway in Nepal. This research study has two components–PoSHAN Policy and PoSHAN Community. The former is conducted by Tufts University in partnership with HKI, Patan Academy of Health Sciences (PAHS) and Valley Research Group (VaRG). In collaboration with the Child Health Division (CHD) and the National Planning Commission (NPC), the research has been conducted in 21 randomly-selected field sites across Nepal over the past two years with key informants at national, district, Village Development Committee (VDC) and Ward levels as part of the PoSHAN Process to analyze how a range of policies and programs are translated from the design to the implementation phase. This policy component is complemented by a community level study, managed by Johns Hopkins University.

List of Program Partners[1]

Helen Keller International in collaboration with Tufts University Nutrition Innovation Lab-Asia, partners with different government and non-government organizations including the Patan Academy of Health Sciences (PAHS), Valley Research Group (VaRG), Nepalgunj Medical College Hospital (NMCH), Child Health Division (CHD), the Ministry of Health and Population (MoHP) and the National Planning Commission (NPC).

Acronyms

1. BMS – Breast Milk Substitution
2. FCHV – Female Community Health Volunteer
3. FLW – Frontline Worker study
4. FSO – Field Study Officer
5. PoSHAN – Policy and Science for Health, Agriculture and Nutrition
6. VaRG – Valley Research Group

[1] US universities and international partners by country

7. HKI – Helen Keller International
8. VDC – Village Development Committee
9. MSNP- Multi-Sectoral Nutrition Plan
10. NHRC – Nepal Health Research Council
11. PAHS – Patan Academy of Health Sciences
12. Suaahara – USAID funded nutrition program
13. Sabal – USAID-funded livelihood program
14. BBNC – Bangalore Boston Nutrition Collaborative
15. CHD – Child Health Division
16. MoHP – Ministry of Health and Population
17. NMCH – Nepalgunj Medical College Hospital
18. NPC – National Planning Commission

I) **Executive Summary**

PoSHAN is ongoing process research being undertaken in 21 sites across the mountains, hills, and terai of Nepal. The longitudinal prospective study has completed two rounds of data collection. Findings from the first round of data collection were shared with the wider stakeholder network during the third Scientific Symposium in November 2014, and research briefs were made available to the various levels of government in the study districts. Data analysis of the Round II study, conducted in 2014, is ongoing. Data collection for Round III was planned for the summer of 2015, however, the massive earthquake of April 25 made it impossible to carry out the study in several severely affected PoSHAN survey districts.

This year, the plan was to conduct the Frontline Worker (FLW) study along with PoSHAN Round III, so both studies were assigned to the seven Terai districts and the two sentinel sites, Banke and Jumla, to cover nine of the 21 PoSHAN study districts, in line with the PoSHAN community study. The FLW study was to be conducted simultaneously in four additional districts in the Far-Western Development Region where the Suaahara and Kisan projects are operating to assess the effectiveness of integrated nutrition programs. While awaiting final IRB approval for the FLW study, further delays occurred due to political unrest that led to a string of *bandhs* (protests) and government-enforced curfews, which made it impossible to conduct the studies in the Terai. However, as soon as it was possible, the field study team moved to the Far West and completed the FLW study during this reporting period.

The new major activity initiated this year is the Afla Cohort research, a birth cohort study designed to explore the relationship between maternal exposures to mycotoxins, birth outcomes and stunting in infants. A protocol outlining the aims and study goals, methods, and implementation of the study were developed and seven exploratory focus groups were conducted in four VDCs in Banke. Study tools, including protocols and interview instruments, were prepared and submitted to the Nepal Health Research Council for IRB approval and the research site set-up, staffing and training were conducted in Nepalgunj between February and April 2015. Field and clinical teams were trained on study protocols, including data collection and entry in tablets (in both Nepali and Awadhi), based on the training manuals and standard operating procedures for each activity. A fully-functioning lab at Kohalpur was established with all necessary equipment installed for sample processing and storage.

The earthquake and subsequent aftershocks delayed the completion of preparation and start-up activities. A "soft" start-up began following the official launch on July 1, 2015. This small start-up provided an opportunity to refine the study tools, rectify the glitches in the database and strengthen the monitoring and tracking systems. In August, demarcation of new state boundaries was declared by the Constituent Assembly, which led to political unrest among the ethnic minority groups. This was followed by a string of *bandhs* that included the Banke district and government-enforced curfews in the neighboring districts of Surkhet and Kaiali, rendering it impossible to conduct study activities. The enrollment of study participants will resume when the district is free of politically-activated, ongoing bands.

II) **Program Activities and Highlights: October 2014-August 2015**

PoSHAN Policy and Frontline Worker Studies

Study findings from the first round of data were shared during the third Scientific Symposium in Kathmandu in November 2015, and research briefs were shared with all PoSHAN study districts. While analysis and reporting for the PoSHAN Round II were carried out by the Nutrition Innovation Lab-Asia team at Tufts University, preparation for PoSHAN Round III began with the development of the scope of work, preparation of the tools and protocols, and submission to the IRB.

During the same period, discussions continued around the selection of sites for a Frontline Workers (FLW) study, designed to assess the process of bringing integrated nutrition information and services to

communities. It was decided that the FLW should be conducted along with the PoSHAN policy study, as well as in four of the Suaahara districts in the Far West. Unfortunately, these plans were thwarted when an earthquake measuring 7.8 on the Richter scale occurred on April 25. The earthquake and the hundreds of aftershocks caused massive devastation in the hills and mountains of the western and central regions of Nepal, bringing routine activities to a halt. Several of the PoSHAN districts were severely affected and it was not safe or appropriate to have enumerators in the field. After a series of discussions on how to reassign the districts, the Tufts team decided to go ahead with the seven terai districts and the two sentinel site districts—Banke and Jumla—for both PoSHAN Policy and Community studies and the FLW. The additional four far-western districts—Baitadi, Dadeldhura, Doti and Achham—were also assigned to the FLW study.

Valley Research Group (VaRG) was selected to conduct the study, based on their capacity, quality of work performance and experience with both studies. Once IRB approval for both studies was received, the training of the enumerators was completed and the enumerators prepared for the field work. However, just as the teams were scheduled to depart to the field, the designation of States by the Constituent Assembly led to political unrest among minority ethnic groups in different parts of the country. Violent confrontations called *bandhs* and curfews occurred in the Terai and in some hill districts. Because of this, VaRG was unable to send their teams to the field for several weeks. When the situation became sufficiently safe, their teams proceeded to the far west of Nepal for the FLW study.

Aflatoxin study

A protocol outlining the aims and study goals, methods, and implementation of the study was developed in November 2014, and since then, protocols and guidelines have been prepared and revised to incorporate on-the-ground realities. The study will be conducted in 17 Village Development Committees of the Banke District, a multi-ethnic terai district in the Mid-Western Development Region. A brief outline of the activities and a timeline is shared below:

Aflatoxin Focus Group Discussions: Seven exploratory focus groups (four with women and three with men) were conducted using a semi-structured discussion format to assess: (1) definitions of food safety; (2) awareness of mycotoxins; and (3) knowledge of how to manage mold/fungus during pre-harvest, post-harvest, storage, and household consumption. The study was approved by the Nepal Health Research Council (NHRC) on December 11, 2014 and the focus group discussions (FGD) were conducted from February 2-6, 2015 in four VDCs in Banke.

Study approval for aflatoxin study: Study tools were finalized in February 2015, and the protocol was submitted to NHRC and approved on February 20, 2015. Study guides and manuals were also developed in English and Nepali during this period.

Hiring of agency and staff: Locus Solutions was hired through a competitive bidding process to develop the electronic data collection system using tablets. In February-March, staff hiring began with the Field Coordinator and the Senior Nurse, followed by Field Supervisors, Enumerators and Nurses. Field Guides and the Lab Technician were hired in early June.

Banke site set-up: A formal relationship was established with Nepalganj Medical College (NGMC) in Kholpur to provide an onsite laboratory for the biological samples and an office for the clinical nursing team, under the leadership of the senior nurse. The agreement includes their provision of ultrasound services for the study. A field office was established in Nepalganj, as a base for the field teams under the leadership of the field coordinator.

Training: A month-long training for field supervisors, enumerators and the clinical team was conducted in March-April. The training was held in Nepalganj each day, where the clinical and field teams received

theoretical training on each of the protocols and procedures, followed by practice sessions and reviews for technical accuracy.

Delay due to the earthquake on April 25: The earthquake on April 25, caused several weeks' delay in carrying out the next steps in the study preparation.

VDC-level orientations: In May and June, study teams led by the field supervisors visited the VDC secretary, health post officials, and the FCHVs in all 17 study VDCs to introduce the study goals and methods, and to establish relationships with the government management and outreach services centers.

Pregnancy census and mapping: In June, following the orientations, the field teams obtained a list of pregnant women from the FCHV's register in each ward (nine per VDC), verified the pregnancies and prepared a record of the potential study participants. A mapping of the VDCs was also carried out.

Official Launch and enrollment: The launch of the Afla Cohort study took place in Nepalgunj on July 1 and enrollment started from July 5. After an initial enrollment of 70 participants, some early issues arose, particularly with the study protocol and the use of tablets. It was decided that no more enrollments should be made until these issues were resolved.

Due to the refinements required in the field, both technical and staffing, and a nationwide and terai-specific strikes and curfews, fieldwork was impossible during August and September 2015. Work will resume sometime between the end of September and beginning of October 2015.

III) **Key Accomplishments**

Two major accomplishments of this reporting period are mentioned below:

Mobilization of the field team for data collection of Round III PoSHAN study and FLW study: Despite the delays caused by the major earthquake and political unrest in the country, the field team was trained and mobilized for data collection in the study districts.

Initiation and startup of Afla Cohort study activities
Tremendous time and effort has gone into planning, preparation and initiation of the Afla Cohort study. Banke has a fully trained and functioning field team with a Field Study Officer, Supervisors, Enumerators and Field Guides in place. Training of locally-hired field staff with limited knowledge and experience in research was one of the most challenging tasks. Both the one-month intensive master training and a series of refresher training sessions has created a solid skill-set among each cadre. Though there were challenges in retaining the initially-hired Nurses and Head Nurse for the clinical team, a strong clinical team is in place, including a lab technician and two ultrasonologists.

Strong collaboration with national and local government and non-government partners for this study is another accomplishment. The official launch of the Afla Cohort study brought together the Director of the Nepal Health Research Council from Kathmandu, and the District Public Health Office and District Development Committee Office from Banke, all of whom are very supportive. During the VDC orientation sessions the study team established relationships with VDC officials, health post and sub-health post staff and the FCHVs in the study VDCs. The pregnancy census activity provided a good opportunity for the study team to interact and build relationships with the community households.

A formal relationship was established with Patan Academy of Health Sciences (PAHS) in Kathmandu and Nepalgunj Medical College in Kholpur, Banke district. NGMC has provided an office space for the clinical team, and a lab space where blood and breast milk samples will be centrifuged and stored at -20C before

being transported to the PAHS facility in Kathmandu for storage at -80C before being transported to the US. Both the study office in Nepalgunj and the lab-office site at Kohalpur are equipped with internet service and a power supply with a back-up system.

Locus Solution was hired to develop the database for front and backend management of data. Despite complications with the system, the continuous communication between Locus Solution and the study team has resulted in an error-free database system with both a Nepali and Awadhi frontend interface. We are now ready for full-fledged enrollment.

IV) **Research Project Reports**

(1) Name: PoSHAN policy process survey

- Booklet of findings of PoSHAN Round I survey
- District briefs for 21 study districts

V) **Human and Institutional Capacity Development**

The objective of the one-month training for the field and clinical teams in March-April 2015 was to equip them with the skills, knowledge and competencies to conduct the Afla Cohort study activities, and collect accurate and complete data, following the study protocol and ethical guidelines.

The field team, including the Field Coordinator, six Supervisors and 16 Enumerators, were oriented on the study protocol and research methods, including research ethics, informed consent, confidentiality etc., and trained to use the study tool on electronic devices (tablets). They were also trained to conduct anthropometric measurements on mothers and babies. Classroom training was followed by a practice session in two non-study VDCs. Each day of training started with an assessment followed by a discussion on the issues from the previous day. By the end of the training, the supervisors and enumerators were able to understand the study protocol, the aim, specific objectives and significance of the study; able to correctly use the tools on paper and in electronic form, understand the process of consent and for administering surveys; and were aware of their roles and responsibilities as supervisors/enumerators and aware of research ethics.

The clinical team was oriented on the study protocol and research ethics, which was followed by practice sessions at Nepalgunj Medical College, in their hospital at Kohalpur. They were also assessed through pre- and post-tests.

Training for PoSHAN and FLW

Training of 11 Enumerators for PoSHAN Round III and FLW was conducted over six days from July 13-20, 2015. Of these, seven were involved in PoSHAN Round II. Of the seven enumerators conducting the FLW survey, three had experience with both PoSHAN and FLW.

Pre-training evaluation was held at the beginning of the training, with an average score of 34.5 out of 43.

Day 1 -The training began with an introduction to the Nutrition Innovation Lab-Asia, partners involved, objectives of current research, ethics in research, the consenting process and district level questionnaire.

Day 2 - Began with a quiz and review of the previous day, followed by questions, clarifications and discussion on the district and ward-level process and protocols. Tablets were also introduced on the second day.

Day 3 - Sstarted with a review of the second day. Data collectors practiced doing interviews among themselves, using the tablets. Mock interviews were conducted to familiarize them with the questionnaire and to check skip patterns in the tablet.

Day 4 - Spent going through the reporting forms and format with the enumerators and supervisors. The entire process of data collection was covered.

Day 5 – Allocated to field testing/practice. A total of 24 interviews were conducted. Five interviews were conducted at the district level with the various officials—health-2 interviews, livestock-2 interviews and agriculture-1 interview. One health personnel interview was conducted at the Health Post level and at the Sub-Health Post level, and 17 were held at the VDC level (FCHV-14 and Ward Citizen Forum-3).

Day 6 – Discussed issues/challenges faced during the field testing. The post-training evaluation was conducted at the end of the training with an average score of 38.

Annual Report to Tufts University from Heifer International Activities funded by the Innovation Lab for Nutrition-Asia NEPAL

Year 5 (2014-2015)

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I) Executive Summary

Heifer International received funding from the Nutrition Innovation Lab-Asia to pursue two projects in 2013-2015. These projects are both based in Nepal, and were implemented by their partner organization, Heifer Nepal. The projects are described below, along with the progress in each over the past 12 months.

1. **Project 1B.** This project was a follow-up survey of a cohort of 415 rural families previously studied by Heifer Nepal from 2009-2011 (Project 1A). The families resided in three districts in Nepal: Nawalparasi, Chitwan, and Nuwakot. The initial investigation (Project IA) was a two-year randomized controlled trial of the effects of community development activities (supervised by Heifer Nepal) on child health and nutrition. Project 1B is a four-year follow-up of these families, assessing primary outcomes of child health and growth, as well as secondary outcomes of household socioeconomic status, income, animal ownership, land ownership, and dietary diversity.
2. **Project 2.** This new project was funded by the Nutrition Innovation Lab, and began in the spring/summer of 2013, in the Banke District in Nepal. The goals are to investigate child health and nutrition in communities randomized to receive one of three interventions: (1) Heifer community development activities and livestock training, supplemented by specific training in child nutrition; (2) livestock training and nutrition training alone; or (3) no activities.

VI) Program Activities and Highlights

In order to conduct these activities, the existing Memorandum of Understanding (MoU) between Heifer International and the Nutrition Innovation Lab was expanded to cover the scope of activities. Heifer also maintained a consultancy arrangement with Dr. Miller. An MoU between Heifer International and the Harvard School of Public Health was also established.

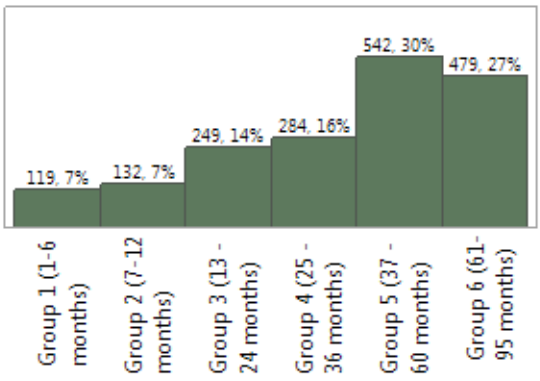
Project 1B. The following activities have been completed:

a. Completion of field work and data collection.
b. Data cleaning and data entry.
c. Data analysis.
d. Manuscript published in *Food and Nutrition Bulletin,* "Community development and livestock promotion in rural Nepal: Effects on child growth and health," Vol. 35, No. 3, 2014. PDF attached.
e. Manuscript in press, "Head growth in rural Nepali children," *Paediatrics and International Child Health* (to be featured with accompanying editorial).
f. Manuscript under review: Dietary diversity among rural Nepali children.
g. Manuscript preparation in process, "Food allocation choices, household animal resources, and dietary diversity in rural Nepali households"
h. Manuscript planned, "Household health practices and child growth and health in rural Nepal" (analysis underway).
i. Manuscript planned, "Women's educational level and responses to a livestock intervention project: outcome of household health practices/SES/income"
j. Abstracts submitted to the Nutrition Innovation Lab November 2014 Scientific Symposium:
    a. Growth and Health of Rural Children in 3 Districts of Nepal: Effect of a Community Development Intervention over 48 Months.
    b. Household and Child Dietary Quality across Seasons in Rural Nepal: Effectiveness of a Community Development Intervention.

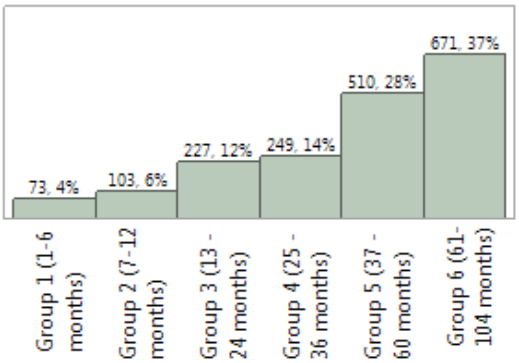
Project 2: The following activities have been completed:

a. Progress reports and renewals submitted as necessary to NHRC.
b. Progress reports and renewals submitted to Tufts University Institutional Review Board.
c. Three rounds of data collection have been completed (Round 1: July-August 2013; Round 2: April 2014; Round 3: November-December 2014). The interval between Round 1 and Round 2 was eight months (there was a delay in starting the project activities due to local conditions); between Round 2 and 3 was seven months, and between Round 1 and 3 was 15 months. The difficulties in this schedule were necessary due to local circumstances. A fourth round was scheduled for April 2015, but was cancelled due to the earthquake in Nepal. A fifth round (24 months from baseline) is scheduled for the end of November 2015. A sixth round is expected in April 2016. This will be a 30-month time point needed for analysis of seasonal trends.
d. The baseline data collection included 953 households (289 assigned to Heifer plus nutrition training group, 360 assigned to training-only group, and 304 assigned to control group). These households had a total of 1,300 children <5 years of age (350 from Heifer plus nutrition training group, 510 from training only group, and 440 from control group). Altogether, there were 1,057 mothers interviewed (some households had >1 eligible mother as extended family members often share a single household in Nepal).
e. After the baseline survey, Heifer field teams began work with the Full Intervention group as well as the Training Only group.
f. The data has been cleaned and entered for the first three rounds. Round 1 and Round 2 have been cross-matched. This remains to be completed in Round 3.

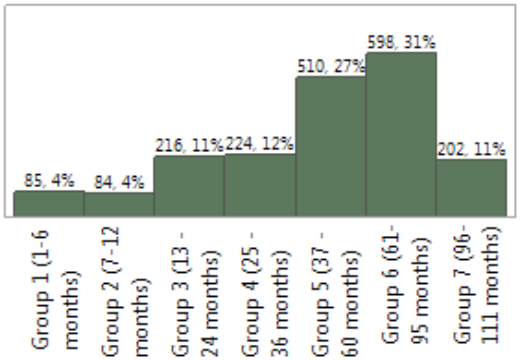
The distribution of ages for the children included in the three surveys is shown below, with the numbers in the target age range (0-60 months) and total indicated:



Round 1: 1,326 in target age range-total 1805. Numbers above each bar indicate N and % of the total for each age group.



Round 2: 1,162 in target age range-total 1,883. Numbers above each bar indicate N and % of the total for each age group.



Round 3: 1,119 in target age range-total 1,919. Numbers above each bar indicate N and % of the total for each age group.

g. Difficulties have become apparent with matching of the three groups at baseline; further statistical analysis of this problem is underway. An analysis plan will be developed with the aid of our statistical consultants to address this difficulty.

VII) **Key Accomplishments**

Project 1B

a. Field work and data entry completed.
b. Additional manuscripts in preparation to be submitted.

Project 2

a. Project data collection is proceeding
b. Enrollment expected to provide adequate power for statistical analysis.

VIII) **Research Program Overview and Structure**

These research activities have been conducted in collaboration with Heifer Nepal. The organization uses the introduction of livestock and related training as tools for poverty alleviation, citizen empowerment, and community development. Heifer International activities focus on the distribution of livestock and training to rural women's groups with an emphasis on income generation. These activities occur within the context of a strong focus on the development of social capital, specifically citizen empowerment, values training, social mobilization, microcredit, and enterprise. Heifer International values research as a means to inform their field activities and policies. As they are active in 68 countries throughout the world, research findings can be quickly disseminated into field practice, to benefit child health and nutrition outcomes in their project areas. Indeed, results of Project 1A (the initial 24 months of data collection in the Nawalparasi, Nuwakot, and Chitwan Districts) revealed a need for expansion of nutrition education as part of the Heifer Nepal program. Subsequently, a nutrition curriculum was developed for Heifer International programs in Asia and Africa, and is currently being introduced as a supplement to existing Heifer International activities in these regions.

Project 1B:

1) Name: "Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition"
2) Description: Follow-on project to allow 48 month longitudinal data collection in cohort initially studied by Heifer International in rural Nepal over 24 months. Project 1A enrolled 611 children in 415 families, with results obtained every six months for two years of a 125-item questionnaire addressing demographics (family composition, socioeconomic status, income sources, livestock ownership, child health, child nutrition, and dietary diversity). In addition, anthropometric data on all household children was collected. While important trends and differences in outcomes were seen at 12 and 24 months, it was hypothesized that improvements in child health and nutrition will increase with longer duration of Heifer interventions. Alternatively, reduced benefits of Heifer activity on child nutrition might have been seen as time progressed. Project 1B was designed to test these hypotheses.

Specific Aim #1: Extend data collection for previous existing project. The opportunity to extend this project provided a special opportunity to obtain longitudinal nutritional data in a large sample of children, in the context of socioeconomic, demographic, and other parameters.

Specific Aim #2: Analyze effects of Heifer Nepal activities on outcomes of child health and nutrition at four years after start of intervention.

a. Evaluate longer-term outcomes of Heifer activities on child growth and health.
b. Identify characteristics of families and children who demonstrate most improvement in child nutrition.
c. Identify characteristics of families and children who demonstrate least improvement in child nutrition.

d. Use this information to further refine Heifer activities and programs to benefit the most malnourished children.

3) Collaborators: Heifer International (Little Rock, Arkansas), Heifer Nepal (Kathmandu, Nepal), Dr. Laurie Miller (Heifer International, Consultant), Dr. Beatrice Rogers (Professor, Friedman School of Nutrition Science and Policy, Tufts University), and Dr. Robert Houser (Statistician, Friedman School of Nutrition Science and Policy, Tufts University). Additional guidance and input from Nutrition Innovation Lab leadership (Dr. Patrick Webb, Dr. Shibani Ghosh, Dr. Jeffrey K. Griffiths).

4) **Achievements:**
   (a) Successfully completed data collection and child anthropometry to obtain 48 month results for 415 households in the Nawalparasi, Nuwakot, and Chitwan Districts.
   (b) Two manuscripts accepted (one published, the other in press).
   (c) One manuscript under review.
   (d) One in near-final form; submission anticipated soon.
   (e) Three additional manuscripts in preparation.

5) **Capacity Building:**
   (a) Successfully mentored Nepal-based research NGO (Nepal Technical Assistance Group, NTAG) in conduct of longitudinal research project over four years.
   (b) Supervised Nepali staff in data cleaning and data management for longitudinal research project.
   (c) Developed research skills of Heifer Nepal office and field staff.
   (d) Heifer Nepal staff and NTAG staff received training in Ethics of Human Subjects Research.

6) **Lessons Learned:**
   (a) Special expertise is required to successfully conduct longitudinal research projects.
   (b) Feedback from Field Enumerators can provide valuable insights into project success and candid assessments of interventions.

7) **Presentations and Publications:**
   (a) Published: "Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition"
   (b) In press: "Head growth of rural Nepali children"
   (c) Under review: "Dietary diversity among rural Nepali children"
   (d) Discussion and revisions with coauthors underway, with anticipated submission by October 1, 2015. "Duration of program exposure is associated with improved outcomes in nutrition and health: the case for longer project cycles from intervention experience in rural Nepal.
   (e) Manuscript preparation in process, "Food allocation choices, household animal resources, and dietary diversity in rural Nepali households"
   (f) Manuscript planned, "Household health practices and child growth and health in rural Nepal" (analysis underway).
   (g) Manuscript planned, "Women's educational level and responses to a livestock intervention project: outcome of household health practices/SES/income"
   (h) Abstracts presented at Nutrition Innovation Lab November 2014 Scientific Symposium:
   (i) Growth and Health of Rural Children in 3 Districts of Nepal: Effect of a Community Development Intervention over 48 Months
   (ii) Household and Child Dietary Quality across Seasons in Rural Nepal: Effectiveness of a Community Development Intervention

Project 2

1) Name: "Child health and nutrition after livestock interventions in rural Nepal: disaggregating the effects of social capital development and training inputs"
2) Description: Project 2 was designed to extend on the results from Project 1A. While important effects on child nutrition and health were observed in the first two years of data collection for Project 1, it was recognized that these changes occurred in the absence of specific interventions addressing nutrition. Thus, we hypothesized that inclusion of a nutrition intervention would further improve child nutritional

outcomes. A basic nutrition education curriculum was developed and field tested by Heifer Nepal. However, the effect of the use of this curriculum on child growth is unknown. In addition, Heifer Nepal activities in Project 1A were not disaggregated with regard to specific animal husbandry training, provision of livestock, and community/social capital development. Heifer Nepal community development activities typically include broad supports related to promotion of social capital (values training, facilitation of formation of women's groups, social mobilization, training in savings, microcredit, and enterprise), along with training in animal husbandry and provision of livestock. Given the results in Project 1A and 1B, it was important to attempt to isolate the effect of the community development activities on the child health and growth outcomes.

Specific Aim #1: Conduct a randomized controlled trial to evaluate the effects of the nutrition curriculum on child growth. The trial was designed to include matched communities in Heifer Nepal working areas. Communities were randomly assigned to receive either: (1) Heifer activities plus the nutrition curriculum; (2) training in child nutrition and animal husbandry, and provision of livestock, without social capital activities; or (3) no interventions. Surveys to address demographics (family composition, socioeconomic status, income sources, livestock ownership, child health, child nutrition, and dietary diversity) were conducted at baseline, and then every six months for two years (five surveys total; two are completed). Anthropometric measurements are obtained on all household children at each survey time, along with indicators of child health.

Specific Aim #2: Analyze the effects of the introduction of the nutrition curriculum on child growth and nutritional status.

a. Assess child nutritional outcomes.
b. Determine characteristics of families related to child nutritional and health status.
c. Identify behavioral changes among participants as a result of curriculum.
d. Conduct focus groups among participants to evaluate responses to the use of the curriculum.

3) **Collaborators:** Heifer International (Little Rock, Arkansas), Heifer Nepal (Kathmandu, Nepal), Dr. Laurie Miller (Heifer International, Consultant), Dr. Beatrice Rogers (Professor, Friedman School of Nutrition Science and Policy, Tufts University), and Dr. Robert Houser (Statistician, Friedman School of Nutrition Science and Policy, Tufts University). Additional guidance and input from Nutrition Innovation Lab leadership (Dr. Patrick Webb, Dr. Shibani Ghosh, Dr. Jeffrey K. Griffiths).
4) **Achievements:** With the assistance of Valley Research Group, field enumerators enrolled 953 households (289 assigned to Heifer plus nutrition training group, 360 assigned to training-only group, and 304 assigned to control group). Baseline data was collected from 1,057 mothers in these households (some conjoint households had >1 eligible mother), and anthropometry and child health information was obtained on 1300 children <5 years of age (350 from Heifer plus nutrition training group, 510 from training only group, and 440 from control group). All but 72 mothers were re-interviewed in Round 2 of data collection; an additional 17 mothers and their children were enrolled. For Round 3, 1,025 mothers were interviewed.
5) **Capacity Building:** (a) Heifer Nepal 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.
6) **Lessons Learned:** We have encountered two problems which interfered or likely will interfere with data collection in our project area. The baseline data collection took place during July-August 2013. Round 2 data collection, which was initially scheduled for January-February 2014, was postponed until March-April 2014, due to unexpected political activity in the area which made travel difficult. Round 3 of data collection took place in November 2014, but at the end of August 2015, the region was devastated by severe mud slides. There has been extensive loss of life, property, and livestock. At the moment, the

situation is chaotic, and humanitarian aid is being provided. Round 4 was cancelled due to the major earthquake in April 2015. The next round of data collection is scheduled for November 2015. However, difficult political conditions currently prevail in Nepal, with instability in some areas of the country.

7) **Presentations and Publications:** None to date.

Annual Report
Harvard TH Chan School of Public Health
Feed the Future Innovation Lab for Nutrition-Asia
Year 5 (2014-2015)

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I) Executive Summary

One of the main reasons for the current focus on stunting in the nutrition world is that it is a proxy for the brain development of infants and children. In recent years, there has been interest in trying to use more direct measures of brain development to try to understand more directly the benefits of nutritional interventions in the first 1,000 days. However, tools often used in high-income countries are hard to administer in rural populations in low and middle- income countries, particularly in rural areas where the problem of malnutrition is most prevalent. This year, the main activity we had planned was to assess the feasibility of including a home-administered version of the Ages and Stages-3 Questionnaire (ASQ-3) in the context of a study being undertaken in western Nepal by Heifer International and Tufts University.

During Year 5 of our work for the Feed the Future Innovation Lab for Nutrition-Asia, we tested a home-administered ASQ tool in the Banke District, Nepal administered to children. In preliminary analyses we have evaluated the internal consistency of the tools for five domains and for the total score. We are currently undertaking a comprehensive analysis of the data and preparing a manuscript for submission based on this study.

II) Program Activities and Highlights

This was a productive and eventful year for the collaboration between researchers at the Harvard TH Chan School of Public Health, Tribhuvhan University and the University of Bergen. Our joint research expanded beyond Bhaktapur to the far Western District of Banke in which we undertook a joint study to pilot the feasibility of administering a locally-adapted version of the ASQ tool in collaboration with researchers from Tufts University and Heifer International. This tool is noted for its ease of administration and the short amount of time it takes to administer in the field. The study, nested within a larger controlled trial, used trained enumerators to collect data from children directly in the homes of study participants. This approach to the assessment of child development represents a shift from traditional approaches, which normally are administered under controlled conditions in a clinic. It is hoped that efforts such as these will enable us to measure brain development directly rather than relying on proxies such as child stunting and, therefore, enable research in remote areas of Nepal to understand which interventions have the greatest promise to allow children to reach their cognitive and developmental potential. We are currently undertaking advanced analysis of the data from the study (see update below) and expect to submit the publication to a journal. We also continued to advance a number of papers towards publication in peer review journals, drawing on the data collected from Banke and from the rich dataset from Bhaktapur.

III) Training and Capacity Development

As part of the survey described above, 10 field staff (seven females, three males) from Green Valley Research participated in a training session on methods to administer the ASQ tool. The training was administered over four days in November, 2014, by a team of experienced staff from IOM including Dr. Merina Shrestha and Dr. Prakash Sunder Shrestha, and Dr. Laurie Miller from Tufts University, and involved classroom review of the questionnaires and the theory behind assessment as well as field site supervised practice. Field site testing and supervision of the tool was also undertaken for eight days by Ms. Bimala Karmacharya, an experienced supervisor in the field of child development and ASQ assessment from Bhaktapur. Given how little research has been conducted on this important topic in the context of rural Nepal, this represents an important development of capacity that we hope will also be utilized in the future.

IV) Lessons Learned

A number of lessons were learned as part of the process of modifying the ASQ tool to the local setting, training enumerators, and implementing the study. As few such studies have been conducted previously in rural Nepal, it is important to reflect on these lessons. The tool takes approximately 20 minutes to administer by trained enumerators, which makes it feasible to integrate into larger surveys. Enumerators were able to use either questions or observation (ideally both) to collect information with the tool, which proved useful in situations where barriers made communication challenging. Administering the tool in a home environment was sometimes challenging, particularly when other children were present, who would take the toys used in the study; having other distractions ready for children not participating in the ASQ observations was helpful.

Extensive work went into training the enumerators, and the trainers felt that the practice sessions in the field were helpful as was supervision by an experienced psychologist of data collection in the field for the first part of the study, as she was able to reinforce the lessons learned during the training exercise. Strong community ties of the Heifer staff to the surveyed families also helped with the success of the survey, as households were cooperative and patient during the administration of the survey tool.

Last year, we realized that despite having considerable good will among our partners, we had limited person power on the existing team to move papers forward expeditiously. To help fill the capacity gap, we had originally intended to hire a post-doctoral fellow. However, with the short time period of less than a year remaining, it was difficult to recruit a candidate for this post, and so we instead decided to hire four graduate students from Harvard School of Public Health to assist with analyses and data processing tasks. Having the extra capacity on hand to undertake analyses with the guidance of our senior team members was extremely helpful in advancing many of our analyses.

We consciously invested a great deal of time over the past several years in providing feedback and guidance on papers being led by our Nepali colleagues as one of the main goals of the collaboration has been to build the capacity of Nepali scientists to undertake nutrition research. We are pleased to report that two of the papers submitted for peer review this year were led by Nepali researchers as the primary author. One of these papers has already been accepted (see below).

Due to disruptions associated with the April 2015 earthquake, the validation analysis using data from Bhaktapur of the ASQ against the Bayley score being led by our colleague, Dr. Merina Shrestha, was delayed. We also had to adjust our plans for the analysis of the paper from Banke, bringing in additional support from an experienced data analyst already at Harvard, to help with some of the more rigorous analysis. While this delayed the preparation of the paper slightly, we are now moving forward rapidly and are aiming for a final submission to a journal of this publication by the end of October.

V) Presentations and Publications

Anemia and iron deficiency in infants and their mothers in Bhaktapur, Nepal

Led by Nepali author Ram Chandyo, this paper was accepted for publication in an upcoming issue of the *European Journal of Clinical Nutrition*. This is the first study from peri-urban Nepal to assess the prevalence of iron deficiency using multiple measures of iron status. Typically anemia (i.e., hemoglobin) is used as an indicator of iron status in low and middle income countries, including Nepal due to the difficulty associated with analyzing other markers of iron status. The paper underscores the importance of continuing supplementation and dietary diversification by women and infants, even in urban settings.

Low dietary diversity and micronutrient adequacy among lactating women in a peri-urban area of Nepal. Published in the March 2015 issue of *Public Health Nutrition*, and led by Dr. Sigrun Henjum, this paper explored the relationships between dietary diversity and nutrient adequacy in Bhaktapur, Nepal. The paper revealed that the mean probability of nutrient adequacy was positively associated with energy intake, dietary diversity, women's educational level and socioeconomic status, and exhibited seasonal trends, peaking in the winter.

Vitamin status of breastfed infants in Bhaktapur, Nepal

This paper highlights work by IOM researcher Manjeswori Ulak and colleagues documenting the prevalence of multiple micronutrient deficiencies in peri-urban Nepal. Although multiple micronutrient deficiencies are believed to

coexist in Nepal, only one paper that we are aware of has explored the prevalence and coexistence of multiple vitamin deficiencies among Nepali infants. This is the first paper from peri-urban Nepal exploring the prevalence of multiple deficiencies including vitamins B6 and B12, folate and vitamins A, D, and E. In addition to generating prevalence estimates for individual deficiencies the paper explores the overlap of deficiencies and sheds light on the importance of efforts to diversify diets and to use fortification and supplementation as measures to address multiple micronutrient deficiencies. The paper is about to be submitted to *Nutrients*.

Food security, socioeconomic vulnerability and nutrition in Bhaktapur prior to the earthquake The earthquake of 2015 heavily hit Bhaktapur, causing considerable damage to structures, which received a great deal of media attention. What received less attention were the potential implications of the earthquake on agriculture-related productivity, livelihoods, and food security/dietary diversity. This paper makes use of data from a survey conducted by researchers from Harvard, IOM, and University of Bergen, brings attention to the importance of seasonal patterns in dietary diversity and highlights the fact that even in peri-urban areas, self-produced food makes an important contribution to dietary intake. The paper is under review at *PLoS One.*

Pilot testing of the ASQ in rural area of Nepal

This paper explores the validity of the ASQ data collected in a sample of 488 children in the Banke District, Nepal. The main purpose of this study was to explore the feasibility of administering a locally-adapted tool assessing multiple aspects of child development (Communication, Gross Motor, Fine Motor, Problem Solving, Personal Social) in a rural context as part of a larger survey, administered by enumerators at the household level. While the ASQ has been tested extensively in various studies in Bhaktapur, we are not aware of any other studies making use of this tool in a rural setting, and its application is of relevance to researchers wanting to make use of a tool to directly measure these domains. We have analyzed the internal validity across different domains of the tool and are nearing completion of confirmatory factor analysis of the tool. We anticipate submission of the paper to a journal this fall.

Dietary diversity indicators and the nutritional status of women, infants and children in Nepal We are reworking a paper examining random within-measurement error to explore the comparative associations of the Women's Dietary Diversity Score (WDDS) vs. the new Minimum Dietary Diversity Score for women (MDDW) in predicting associations with anthropometry, anemia, and iron status of women and children. The paper will also examine issues related to misclassification and measurement error in dealing with the specific relationships with nutritional status outcomes.

Validation study of ASQ against the Bayley score in Bhaktapur

Dr. Merina Shrestha began analyzing the data with colleagues from the University of Bergen last fall but the analysis was put on hold following the earthquake and will be revisited following submission of the pilot test from Banke.

Creation of a food composition database for Nepal

One of the steps involved with processing data from the survey undertaken in Bhaktapur has involved translating data on dietary intake of foods and recipes into nutrients. We are in the final steps of assembling this database and are planning on making the food composition table, which we assembled from databases throughout the world, available for other researchers working in Nepal.

Feed the Future Nutrition Innovation Lab-Asia
Purdue University
Annual Report
Year 5 (2014-2015)

Principal Investigator:
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Objective 1 (as stated in Year 5 implementation plan): Child Nutrition Data Analysis

Understand and measure the connections between agricultural capacity and performance, technology adoption, nutrition outcomes, and conditioning factors at levels of aggregation ranging from household to district levels. Develop an empirically-based and data-driven understanding of the overlap between agricultural issues and health/nutrition issues in Nepal, so as to improve the effectiveness of nutrition policy in Nepal.

Progress achieved, as detailed below.

Objective 2 (as stated in Year 5 implementation plan): Agricultural Price Analysis

In 2013, we worked with partners in the Ministry of Agriculture to obtain a very important set of monthly data on agricultural prices covering more than 45 districts and 20 commodities. The dataset consists of approximately 40,000 data points representing monthly observations of agricultural prices over the period 1998-2011. During Year 5, we designed and implemented protocols to connect these data to DHS and NLSS data to provide a more comprehensive view of the factors associated with child growth outcomes in Nepal.

Progress achieved, as detailed below.

Objective 3 (as stated in Year 5 implementation plan): Capacity Building

Increase the capacity and effectiveness of research institutions in Nepal and train students at the graduate level to become contributing members of the global community fighting against hunger and malnutrition.

Progress achieved, as detailed below.

Introduction/Overview of Work Plan Rationale/Objectives

Nepal faces a number of development challenges, including poor agricultural performance, chronic and widespread child malnutrition, inadequate infrastructure, and–in the wake of the 2015 earthquakes–post-disaster recovery and reconstruction. This Work Plan aims to study available evidence regarding food security, malnutrition and related topics in Nepal and to undertake primary research on key issues relating agriculture to nutritional outcomes, while simultaneously engaging in training to improve knowledge and capacity in Nepal. We attempt to work closely with the Managing Entity (ME) and project partners in Nepal to build new collaborations and strengthen existing collaborations with Nepalese partners around the topic of agriculture and nutrition. Work Plan activities are designed to be fully aligned with Nepal's Integrated Nutrition Plan (INP) goals and priorities as they relate to agriculture

Section I: Research Activities and Progress on Objectives 1 and 2

Focal area: *Discrete socio-economic analysis*

Activity 1: During Year 5 efforts continued to focus on generating research deliverables from prior investments of time and resources. In past years we secured access to a number of datasets, including multiple rounds of the Nepal Living Standards survey (NLSS), Nepal Demographic and Health Survey (DHS) data, and remotely-sensed satellite data (maximum value Advanced Very High Resolution Radiometer [AVHRR] Normalized Difference Vegetation Index [NDVI] composites from the NASA Global Inventory Monitoring and Modeling Systems. [GIMMS] group at NASA's Biospheric Sciences Branch). Working directly with Nepal's Central Bureau of Statistics, we successfully gained access to the most recent round of the NLSS data (2011). In Year 5 we made substantial progress on several fronts, including incorporating data on rainfall and infrastructure (including roads and bridges) to broaden the analysis. We maintained and accelerated momentum on analysis and writing, mostly in the context of Ganesh Thapa's PhD dissertation, which he will complete in December 2015. Keeping with our goal to develop useful data and make these data available to other members of the Nutrition Innovation Lab (NIL) research team, we released an analysis-ready dataset to project partners. We have developed a pipeline of research papers, some of which are in peer review, and some of which exist in working paper form. In previous years, two MS theses were completed at Purdue and a partnership with a graduate student at Tribhuvan University was successfully completed. These past efforts have created a pipeline of output that will continue to appear in coming years as it makes its way through the peer_review process.

Focal area: *Agricultural price analysis*

Activity 2: We obtained from the Ministry of Agriculture a large dataset consisting of agricultural market prices observed at monthly intervals in more than 45 Nepalese districts and seven Indian border markets. These data cover more than 20 important agricultural commodities and constitute approximately 40,000 price observations over the period 1998-2011. We have incorporated these data into our analysis of child growth, and are assessing the empirical evidence regarding the role of agricultural prices and price variability on nutrition outcomes. We have analyzed factors influencing price behavior as a way of identifying available and effective policy levers for influencing nutrition outcomes through sectoral and macroeconomic policy changes.

Lessons learned and challenges in implementing proposed activities

No impediments to progress at this time, although it is important to recognize that the peer-review process can be slow and cumbersome, leading to delays between the execution and appearance of research output.

Solutions/resolutions applied or to be applied

Section II: Capacity Building Activities

Focal area: *Degree training*

Activities: Ganesh Thapa began his PhD training in Agricultural Economics at Purdue in August 2012. Mr. Thapa successfully completed and defended his PhD prospectus in 2014 and is scheduled to defend his dissertation on November 16, 2015. Professor Patrick Webb (Tufts University) is serving as an outside committee member for Mr. Thapa. We are working to position Ganesh Thapa for successful completion of his PhD and reintegration to the academic and policy research community in Nepal. A second student, Celeste Sununtnasuk, completed her MS degree in Agricultural Economics at Purdue in May 2013. She worked extensively with Nepal DHS and NLSS data and joined IFPRI in Washington, DC where she continues to work on food security issues. Binod Khanal, an MS student at Tribhuvan University completed his degree in February 2013. Mr. Khanal undertook fieldwork with the support of a small NIL grant administered by Purdue and started his PhD work at the University of Nebraska in 2014. An additional Purdue MS student, Tim Smith, participated in NIL Nepal research and completed a thesis in 2014. His participation was provided as a cost-share to the project by Purdue. He is now enrolled in the PhD program in Agricultural Economics and continues to work on NIL-related issues.

Lessons learned and challenges in implementing proposed activities

Identifying well-prepared host-country students for graduate degree training in the US was a significant challenge. From a logistical point of view, early project delays and the substantial investment in student recruitment, screening and visa processing meant that we trained only one Nepalese graduate student. We face substantial challenges in identifying relevant post-graduation employment opportunities for Mr. Thapa in Nepal.

Solutions/resolutions applied or to be applied

We have made a commitment to support Mr. Thapa and are maintaining continuity of NIL funding to support him through completion of his degree in December 2015.

Outputs (not previously or elsewhere reported)

Shively, G., C. Sununtnasuk and M. Brown. "Environmental Variability and Child Growth in Nepal." Forthcoming in *Health and Place*.

Smith, T. and G. Shively. "Household vs. community determinants of child nutrition: a multilevel regression approach for Nepal." Draft manuscript in review.

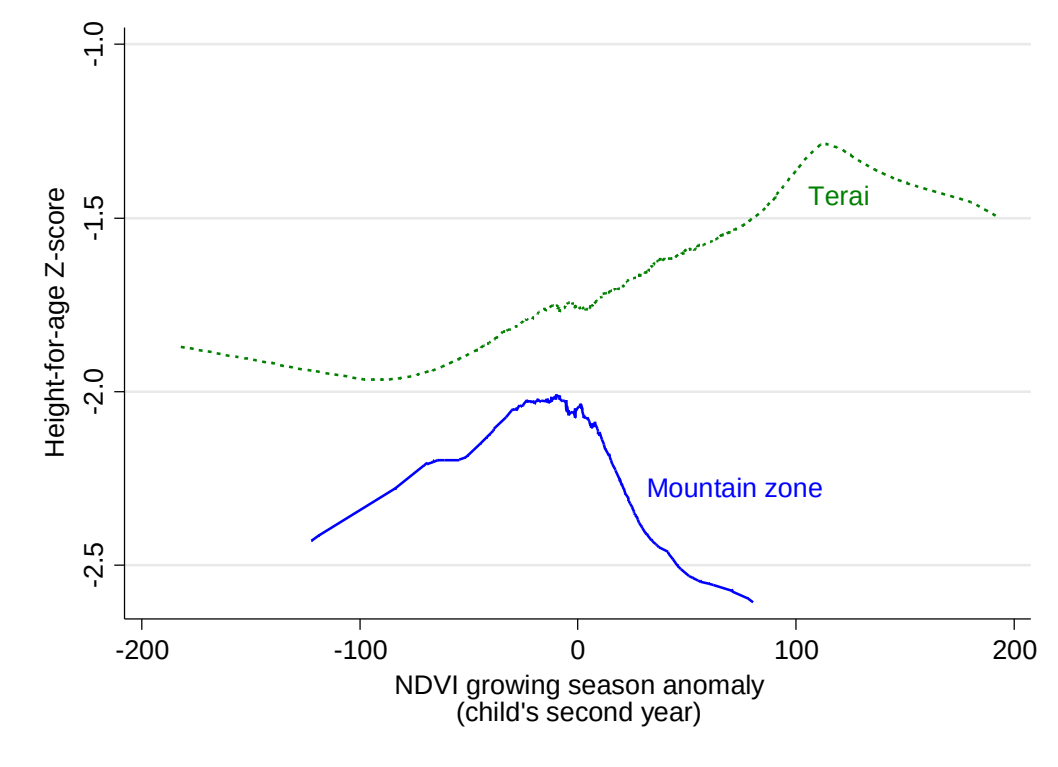
Thapa, G. and G. Shively. "Food prices and market infrastructure in Nepal." Draft manuscript in review.

Leveraging and cost sharing

Substantial leveraging for Year 5 activities came in the form of NASA support for our collaboration with Dr. Molly Brown. While it is not possible to put an exact dollar amount on the value of this leveraging, Dr. Brown devoted substantial amounts of time to our efforts, served as an external committee member for one graduate student at Purdue, participated in a NIL-sponsored organized panel, and continues to collaborate on data analysis and writing. In our use of remotely-sensed vegetation data, we are creatively leveraging hundreds of millions of dollars in past US government investment in satellite data collection and processing. Additionally, Purdue University has supported two MS students who have contributed to project output.

Vignettes

The figure below is drawn from the article "Environmental Variability and Child Growth in Nepal," which is forthcoming in the journal *Health and Place*. That article attempts to draw connections between remotely-sensed data on local growing conditions (as indicated by the Normalized Difference Vegetation Index–NDVI) and subsequent measures of child nutrition outcomes (in the form of weight-for-height and height-for-age z-scores, or HAZ). We find that throughout the NDVI range in which normal values are observed–here roughly 400-800 in the Terai and 500-600 in the mountains—the relationship between WHZ and growing conditions are strongly positive. We see considerable WHZ sensitivity at the extremes of the NDVI distribution, however, and a substantial non-linear break in the observed association. The figure provided below underscores this sensitivity, where we restrict our attention to children 24 months and older to ensure a closer correspondence between agricultural output and the child's food consumption. NDVI anomalies during the growing season of a child's second year appear on the horizontal axis and HAZ appears on the vertical axis. Keeping in mind the important caveat that HAZ reflects outcomes from a cumulative process of health and nutrition shortfalls, these data suggest that HAZ is more broadly robust to departures from normality in the Terai, as one might expect given better agricultural, health and market infrastructure, than in the mountains, where both positive and negative departures from normality are associated with deleterious changes in HAZ. In short, nutrition seems more sensitive to growing conditions in the mountains than in the Terai, and far more sensitive to departures from normality. Additional research being undertaken as part of Ganesh Thapa's dissertation appears to suggest that, in part, the lower nutrition-sensitivity to environmental conditions that one sees in the Terai (vis-à-vis the mountains) emanates in part from better road and market networks that serve to buffer the pernicious effects of agricultural variability by improving market access and moderating food prices for households that are net-buyers of food.



Lowess smoothed graph for HAZ (children > 24 months only) and NDVI growing season anomaly during child's second year, Mountain Zone (n=273) and Terai (n=556). Source: Figure 8 in Shively, G., Sununtnasuk, C., and Brown, M. (2015) "Environmental Variability and Child Growth in Nepal." Forthcoming in *Health and Place*.

CORE & RFA Activities: Nutrition Innovation Lab-Asia
Johns Hopkins University Bloomberg School of Public Health (JHSPH)
Annual Report
Year 5 (2014-2015)

Principal Investigator: Dr. Keith West
Co-Principal Investigators: Dr. Rolf Klemm, Ramesh Adhikari & Devendra Gauchan
Co- Investigators: Swetha Manohar, Sudeep Shrestha, Ruchita Rajbhandary & Raman Shrestha
JHSPH Technical Advisory Committee Members: Dr. Rolf Klemm & Dr. Keith West

List of Countries in which JHSPH operates: Nepal

Program/In-Country Partners in Nepal:

1) Nepali Technical Assistance Group (NTAG)
2) New ERA Pvt. Ltd.
3) Nepal Agriculture Research Council (NARC)
4) Community Medicine and Public Health Department, Institute of Medicine (IOM)
5) Helen Keller International (HKI)
6) Nepal Nutrition Intervention Project-Sarlahi (NNIPS)
7) Child Health Division, Department of Health Services, Ministry of Health and Population (MoHP)

Overall Objective:

To conduct and promote, nationally, research to reveal social, economic and nutrition-sensitive intervention pathways by which agriculture can lead to improved food security and nutrition in rural Nepal.

IX) Program Activities and Highlights: 2014-2015

Fiscal Year 2014-2015 ended having completed: (1) a third partial-panel survey in the aftermath of the earthquake (7.8 in magnitude) that hit Nepal on April 25, 2015; (2) the second round of seasonal data collection in sentinel sites in the mountains, hills and Terai; (3) conducting data analysis and compiling findings from surveys carried out to date; and (4) a third annual scientific symposium linking agriculture to nutrition.

X) Key Accomplishments

- Trained 90+ data collectors, quality control and research assistant staff to conduct the third annual panel survey in nine districts, between March and June 2015. The extended training period and limited sample was due to the earthquake that struck Nepal during the training sessions.

- Completed data collection for the third annual panel assessment in nine districts (approximately 3,600 households interviewed), June-August 2015.

- Completed data entry for the third annual panel survey. Analytic datasets creation (underway) to be shared among co-investigators for data analysis between October-November 2015.

- Completed data collection for the two rounds of seasonal sentinel site assessments in three districts in September-October 2014 and January-February 2014 (approximately 580 and 485 households in sentinel seasonal Round 3 and Round 4, respectively).

- Completed data cleaning and entry of the data collected from the two rounds of seasonal sentinel site assessments. Seasonal Round 3: November-December 2014; Seasonal Round 4: March-April 2015.

- Conducted extensive analysis of data from the first (2013) and second (2014) panel surveys and are in the process of drafting manuscripts on:
  - Patterns of wasting, stunting and overweight among children and women in rural Nepal
  - Risk factors for prevalent and incident stunting in children under five years of age
  - Risk factor for prevalent and incident wasting in children under five years of age
  - Influences of home food production, SES and market prices on dietary intakes of women and children
  - Linkages between antenatal and postnatal care, maternal health knowledge and dietary behavior among women
  - The cost of improving household diets in Nepal (Using the Cost of the Diet method to model lowest-cost dietary changes)

- Agriculture-to-nutrition: design and implementation of a multiyear national surveillance system in rural Nepal

- Served as member of the Emergency Nutrition Cluster, providing assessment, data management and analyses support following the earthquake, in April-June 2015.

- Provided technical input for the development of national-level policies and strategies supporting maternal and child nutrition and delivered guest lectures at national academic institutions.

- Conceived, organized and successfully executed the 3rd annual Scientific Symposium in November 2014, which was attended by 300 participants, including representatives and scientists from government, international agencies, INGOs, NGOs, universities across Nepal, and 55 Nepali graduate students. The Symposium included a half-day student session on Day 3. The Symposium is the largest annual scientific meeting in Nepal.

XI) **Research Program Overview and Structure: PoSHAN Community Studies**

Improvements in agriculture can potentially enhance food security, adequacy of dietary intake, nutritional status and health. Yet, limited empirical evidence exists on the kinds of actions in agriculture that support nutrition and health for poor populations. There is a need to better understand, measure and define causal pathways leading from agriculture to nutrition among vulnerable groups. Modifiable components require testing in order to reduce food insecurity and undernutrition and guide programs and policies that can improve nutrition through agriculture. The PoSHAN Community Studies' goal is to assess and monitor household food security, dietary intake and nutritional status of preschool-aged children and their mothers and examine the extent to which they vary by concurrent and prospectively collected indicators of agricultural production, diversity, local market food prices, and participation in agricultural and microeconomic extension, nutrition and health programs in the three agro-ecological zones of Nepal.

The PoSHAN Community Studies was conceptualized, designed and implemented by JHU and co-Principal Investigators (Co-PIs) from NARC and IOM, in collaboration with Tufts investigators. This national survey has been fielded and data entered each year by New ERA Pvt. Ltd and the seasonal assessment has been conducted by NTAG. Data entry, archiving, QC, management and analysis is overseen or conducted by JHU.

Collaborators: New ERA Pvt. Ltd, NTAG, NNIPS, IOM, NARC, Government of Nepal (Child Health Division, Department of Health Services); all partners are from Nepal.

Achievements on proposed and actual activities based on Year 5 Work Plans and Lessons Learned

Section 1: Research Activities

Objective 1. Disseminate research findings from PoSHAN Community Studies to USAID-DC and other stakeholders in Washington, DC.	
PROPOSED	**ACTUAL**
• Work in collaboration with Tufts University to organize and host, a dissemination event in Washington, DC to disseminate the PoSHAN	• Analyses conducted on risk factors for undernutrition in children under five and market price influences on dietary intake among women, and presented at a Nutrition Innovation Lab dissemination event at USAID/W on September 30, 2015.
Lessons Learned • There is a high demand for data generated from the PoSHAN Study and the presentations were well-received across a wide range of stakeholders. • An interdisciplinary approach has been useful when conducting analyses across the ag-nutrition continuum using a mixture of economic, dietary and biological data.	
Solutions/Resolutions • Continue to enhance the analytic and writing teams (in-country and in the US) to accelerate completion of analyses and publications in peer-reviewed scientific journals.	

Objective 2. Participate in the Nutrition Innovation Board of Directors (BOD) meetings	
PROPOSED	**ACTUAL**
• Participate in the annual BOD meeting	• BOD was not scheduled for this past fiscal year
Lessons Learned • N/A	
Solutions/ Resolutions • N/A	

Objective 3. Continue to identify new research questions that might be addressed using the Nutrition Innovation Lab surveillance site infrastructure, and define, prioritize and identify research questions for analysis and publication with other collaborating partners and the Management Entity (ME) of the Nutrition Innovation Lab	
PROPOSED	**ACTUAL**
• Participate in and prepare for an analysis retreat to be held with Tufts University and other collaborating partners.	• Co-organized analyses meeting held on November 21, 2015 in Nepal with Tufts, Purdue and in-country Nutrition Innovation Lab analyst team. • Participated in Proceedings of the National Academy of Sciences (PNAS) supplement planning meeting on June 5, 2015. • Organized analyses meeting at JHU with Tufts on August 28, 2015. • Participated in several conference calls with multiple partners to work towards joint analyses on PoSHAN data–on March 28, April 8, September 22, 2015.
• Organize quarterly analysis meetings with local PIs and Baltimore PIs to review progress on analyses.	• Not accomplished on a quarterly basis due to scheduling issues.
• Prepare 1-2 research protocols for follow-on studies to be conducted in collaboration with the PoSHAN community studies sites.	• Borlaug fellow and JHU PhD student Elena Broaddus developed a research protocol with the plan of implementing this substudy during the 2015-2016 fiscal year, to examine effects of gardens/small animal husbandry on children's diets, and determine roles of geographic area, season, market access and prices as well as mediators (income, maternal empowerment/decision-making) on associations of gardens/small animal husbandry with children's diets.
Lessons Learned • Establishing and continually building in-country capacity to conduct data analyses is critical to achieve the Nutrition Innovation Lab's commitments and allows for timely interactions about findings within and outside of PoSHAN. This year, the JHU team had two long-term staff trained in advanced statistical methods, one of whom earned an MPH at JHU, but who left the team to take up other opportunities.	

- The Community Studies has a wide range of aims requiring complex cross-sectional and longitudinal data to be generated, mixed analytic methods, and a trans-disciplinary team to take full advantage of this rich and informative database.

Solutions/Resolutions

- While maintaining rigor in field operations, JHU hired two new in-country data analysts, with econometric and population data analysis skills, in March 2015. A recent graduate from JHU's MHSPH program, and a previous intern with the Nutrition Innovation Lab in Nepal, was hired to work on risk factor analyses. JHU has also begun negotiating with a biostatistician in international health to work with the team, pending available funding and the statistician's availability. JHU investigators have also increased effort and attention to completing planned papers.

Objective 4. Conduct data collection in identified sentinel sites to provide seasonal and detailed information about agriculture-program-household dynamics that may affect diet and nutritional status of families.

PROPOSED	ACTUAL
• Initiate and complete data cleaning, checking and entry process for sentinel Round 3	• Completed in October 2014 and released to the research team
• Conduct one round of seasonal data collection in selected surveillance sites.	• Completed sentinel seasonal Round 4 between January–February 2015 in the three seasonal sites.
• Initiate and complete data cleaning, checking and entry process for sentinel Round 4	• Completed in June 2015 and released to the research team
• Conduct analysis for data collected during seasonal assessments conducted in August 2013–February 2015.	• Analyses have been conducted and are being evaluated that display changes in nutritional status, diet, HHFS and food production by season across the three sentinel sites for individual years of operation and across both years.
• Conduct qualitative study on determining reasons for program participation and uptake.	• Not completed given time limitations post-earthquake

Lessons Learned

- The sentinel sites provide a rich resource of seasonal data across the agro-ecological zones which need timely analysis and interpretation. Further, local capacity building to conduct data collection and implement quality control procedures has been an achieved benchmark among data-collection teams who are mostly permanent residents of these rural/semi-rural study sites.
- The sentinel site infrastructure took considerable effort by the central investigative team and field supervisors (liaising with district officials and the community, different stakeholders, transportation of equipment, etc) to build; from the physical offices to their oversight, but the sites were not fully utilized to their potential.
- Transportation within Kathmandu and to study sites continued to be a challenge which required considerable resources (i.e. time, human resources and money).

Solutions/Resolutions

- May need to discuss the possibility of assigning sentinel sites to an analyst within the team, with a major portion of his/her time dedicated to these seasonal analyses. Expertise in longitudinal data analyses would be a clear asset.

- The USAID vehicle available in at the Mission was unable to be attained and discussions continue with the ME to procure a vehicle, perhaps one to be shared between the Tufts and JHU team.

- Sentinel site field supervisors regularly touch base with district officials as do the Kathmandu central staff whenever quality control visits or site visits are made to maintain relationships. Dissemination briefs featuring results from the first panel survey have been sent to the district health, agriculture and livestock offices as well as the District Development Committee office. In September 2014, monitoring visits were conducted which were comprised of representatives from the District Health Office and the Central District Office making field visits to observe how and what type of data is collected by the PoSHAN Community Studies.

- Given funding restrictions, the seasonal data collection activities have ceased for now and thus sentinel site field offices have been closed.

Objective 5. Conduct third annual panel survey for PoSHAN (Policy and Science for Health, Agriculture and Nutrition) Community Studies

PROPOSED	ACTUAL
• Initiate modification to subcontract with New ERA to complete third annual panel survey	• Completed on February 27, 2015
• Inventory equipment New ERA has in stock, specifically HemoCue machines and cell phones, to ascertain working condition for anemia testing and quality control monitoring respectively.	• Completed by February 25, 2015 by Nutrition Innovation Lab/ JHU team in collaboration with New ERA.
• Purchase and complete maintenance of equipment required for annual survey (height boards, HemoCue machines, tape measures, scales)	• Completed by March 30, 2015, equipment was purchased and repaired as necessary.
• Discuss and implement updates to New ERA database to improve data entry processes	• Frequent and engaged discussions were held with New ERA's data management team to ensure all checks were in place for their data entry system and were compatible with the structure of the JHU database.
	• A two-week long Master Training of Trainers was conducted at the New ERA premises with a 30-person team from

• Conduct master training of trainers New ERA- JHU	New ERA between March 13-25, 2015 and led by the JHU team in Nepal.
• Conduct training for data collection teams with New ERA	• 5+ weeks training (in total) and standardization of 90+ data collectors in collaboration with New ERA.
• Conduct second annual panel survey data collection in 21 PoSHAN Community Studies sites	• Data collection started in June 2015 for the third annual panel survey in a reduced sample of nine districts due to the April 2015 earthquake that hit Nepal. Data collection was completed in August 2015.
• Initiate and complete data cleaning, checking and entry process	• Initiated in June 2015 as data was being entered at New ERA and will be completed by October 30, 2015 once the entire dataset is received from New ERA.
• Create analytic datasets from third round of panel data	• To be completed by October 30, 2015 once the entire dataset is received from New ERA.
• Analyze data across three rounds of annual panel data	• To be initiated on October 30, 2015 once the entire dataset is received from New ERA.

Lessons Learned

- Evaluating use of tablets for quality control measures was useful, teaching us that the length and formats of questionnaires will require considerable resources.

- The annual panel survey questions are long and given that ~75% of the sample has been followed for three years, respondents may now be anticipating, to some extent, forthcoming questions which could affect some aspects of data validity in the future, without special attention to this matter. Further, it is necessary to build in attractive yet inexpensive incentives for respondents (e.g., currently, nail cutters and towels), considering the time they have donated each year to this study, while refraining from being coercive in any way.

- Despite the use of iceboxes, further resources are needed to ensure that HemoCue machines are held at valid temperature ranges, as the extreme temperatures this year in the Terai had an impact on some machines.

- The DHS 2016 survey is to be conducted next year (scheduled for February 2016) and will use the same data collection firm, New ERA, for their operation. Collaborations with New ERA and the Nepali Technical Assistance Group (NTAG) continue to be productive and valuable. The logistics required to deploy large data collection teams and upkeep equipment while ensuring quality are immense and both groups continue to strive with JHU to manage their workload.

- Due to the earthquake that hit Nepal in April 2015, three of each of the seven PoSHAN mountain

and hill districts were affected. Of these districts' total population, 95.9% in Sindhulpalchowk, 72.3% in Rasuwa, 60.9% in Ramechhapp, 18.9% in Lamjung, 10.5% in Solukhumbu and 8.5% of their homes in Kathmandu were damaged or destroyed. Damage within VDCs was variable. This caused the sample for the third annual panel survey to change since entering the affected districts for the purpose of conducting a survey may have had negative effects on the surviving population and could have led to substantial cost overruns as well as changes in the study's protocol.

- Early evidence in the new data shows there were fluxes in the study sample sizes in some wards (final numbers not yet received) in the 2015 survey, attributed to migration in and out of the area.

- The earthquake and the existence of the ongoing PoSHAN Communities Studies infrastructure, sampling frame and presence across selected sites for the two years prior to this natural disaster presents an opportunity to assess damage, health, survival and social, economic and productivity conditions in those sites and further, to investigate concepts of resilience in directly and indirectly affected areas.

- Incentives for respondents to participate in the survey may need to be rethought to provide more valued tokens of appreciation (other than soap, toothbrushes and toothpaste, for example) but without being considered coercive and remaining within budget.

- Innovative approaches to dissemination of annual survey findings may be needed at district levels (beyond existing District Dissemination Briefs).

Solutions/Resolutions

- Discussions on the cost-effectiveness of mobile data collection for the fourth annual panel survey plan to be held with the ME.

- Re-visit questionnaires to delete less-useful questions or modules (e.g., nearly uniformly not answered or answered the same ways) and modify to capture the effects of the earthquake, and other new aims that may be discussed.

- Budget for further maintenance of study equipment.

- Upon reviewing the extent of damage in our study sample, we initially considered doing an abbreviated assessment in affected areas and the full instruments in unaffected areas. After extensive deliberation and ongoing relief efforts and finances with our partners, the decision was made that for this year alone, PoSHAN would be carried out in a smaller sample—the seven PoSHAN terai sites and two hill and mountain sentinel sites (Arghakhanchi & Jumla). Other unaffected hill and mountain sites were excluded because their inclusion would not have provided a basis for generalizing survey findings to a national or ecozonal level. The current sample will enable PoSHAN to generate data that are representative of the Terai zone. Maintaining data collection in the smaller sample of three sentinel sites will allow fuller use of seasonal data across the years of its operation. We propose modifying certain questions or modules for the 2016 panel survey to assess damage, loss of life and coping abilities following the earthquake, especially shifts in food production, expenditure and security, diet and nutritional status.

- Continue working with New ERA to carry out the annual surveys for the PoSHAN Community Studies.

- The Nutrition Innovation Lab/JHU dedicated one month of its project's time and resources to

assisting the Emergency Nutrition Cluster where needed (data collection and analyses predominantly) in the month that followed the April 25, 2015 earthquake.

Section 2: Capacity Building

Objective 1. Help build capacity to conduct population-based nutrition research.	
PROPOSED	**ACTUAL**
• Train Nutrition Innovation Lab staff on GIS software and technology for applied use in national surveillance systems.	• Dev Raj Gautam completed an online training entitled 'GIS and Epidemiology' https://www.popdata.bc.ca/etu/onlinecourses/HGEO101 and met with Rajiv Paudel (GIS expert from Winrock International) to learn more about the use of GIS software. • Hired two new data analysts (senior analyst Ruchita Rajbhandary left) with backgrounds in econometric analyses.
• Identify analysts for further training of complex analytic methods who will apply skill sets to analytic datasets.	• PhD fellowship has commenced (August 2015) for Nutrition Innovation Lab employee now working on PoSHAN data for her dissertation. • Not accomplished due to conflicting schedules. Amod Poudyal and Rajan Paudel were engaged in conducting the 3rd annual Scientific Symposium.
• Conduct quarterly meetings with Nutrition Innovation Lab graduates of previous training sessions and engage them in dissemination activities, training and/or analysis activities of the PoSHAN Community Studies.	• Priyanka Agrawal, a Nepali MPH student at JHSPH, won a Global Health Field Placement award to include a dental module (consisted of questions on dental hygiene, practice and missing teeth) to the PoSHAN Community Studies' third annual panel survey. She engaged in the development of the module and training of data collectors, but the module has not been implemented.
• Conduct the 3rd annual Scientific Symposium to assimilate and share findings	• Organized and implemented the 3rd annual Scientific Symposium consisting of 300 participants, including 55 students with a higher quality of work presented this year compared to last. The Symposium included a half-day student session this year, November 2014. • Talk on PoSHAN Community Studies'

on the agriculture-nutrition pathways. • Organize and conduct lectures or workshops with local academic and/or research institutions and stakeholders	research (Cost of Diet analyses and association between agricultural production diversity score and women's dietary diversity score) given at NARC, organized by the NARC Society of Agricultural Scientists on Nov 4, 2014. • Pre-symposia intensive feedback was provided with students and young researchers presenting their research at the 3rd annual Scientific Symposium on presentation format and provide guidance for revisions of abstracts. • During the Scientific Symposium, the Nutrition Innovation Lab team, specifically from Tufts, Purdue and JHU, gave detailed feedback on student research projects– strengths, weaknesses and considerations. This was done in a small group setting of three Nepali students to one to two faculty members. • Two talks were delivered at the USAID/Nepal Mission by Dr. Rolf Klemm and Dr. Keith West on updates on PoSHAN research. • Attended stakeholder consultation meeting for Suahaara follow-on on January 9, 2015 in Kathmandu. • Participated in a meeting on the design of the Suahaara follow-on on January 9, 2015 in Kathmandu with Mary Ann Anderson and BK Subedi, and completed a presentation on the PoSHAN Community Studies' research and its relevance to planning interventions for Suahaara. • Participated in a meeting to provide an overview of the PoSHAN Community Studies' research and its relevance to FFP programs to the new USAID/Nepal Mission FFP team on January 30, 2015. • Participated in a meeting to provide an overview of the PoSHAN Community Studies' research at USAID Global Health Bureau, Washington, DC (Elaine Gray)

• Dissemination meetings with district-level officials in sentinel sites. • Short research findings briefs provided to PoSHAN community.	• Dissemination briefs created and shared with all 21 PoSHAN sites. • Not yet complete

Lessons Learned

- There remains a need to keep in contact with alumni of Nutrition Innovation Lab training programs, and to engage them on a periodic basis, as sources of local knowledge and representatives of the stakeholder community who can assist in disseminating research findings.

- There exists a limited pool of public health nutrition researchers in Nepal who can provide technical input to ongoing nutrition research activities in the country.

Solutions/Resolutions

- An addition to the Nutrition Innovation Lab/ JHU team is a Nepali professional with a PhD in Nutritional Sciences who will assume a leadership role in organizing and implementing the data collection for the PoSHAN Community Studies. He will additionally be tasked with regular alumni meetings with previously training candidates and identifying concrete ways to collaborate.

- The Scientific Symposium continues to be a well-attended and much-anticipated event. Funds have been secured again to hold this annual event for two upcoming years. For this fiscal year, the plan is to hold the event in February/March 2016.

- Provide technical input to national working groups focused on policy and program implementation related to nutrition and food security as done in the past (National Nutrition Surveillance System of Nepal and the Maternal Health Sector Strategy Working Group).

XII) **Presentations and Publications:**

1. PoSHAN Community Studies Manual of Operations, Updated, Year 3
2. PoSHAN Community Studies Manual of Operations, Sentinel Sites, Year 3
3. PoSHAN Community Studies Annual Panel Survey 3 (P3) Data Management Plan
4. PoSHAN Community Studies Analytic Database in STATA for sentinel site rounds in Year 3 as well as the Annual Panel Survey 2 (P2)
5. Kemm R. Current Status and Changes: Results from the PoSHAN Community Studies second Annual Panel Survey at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 18, 2014
6. West KPW. Aflatoxin Exposure during the First 1,000 Days of Life in Rural South Asia Assessed by Aflatoxin-Lysine Albumin Biomarkers at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 18, 2014

7. Fitch C. Barriers to Collaborative Agriculture and Nutrition Research at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 18, 2014
8. Biehl E. Challenges to Turning Nutrition & Agricultural Research Findings into Action at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 18, 2014
9. Dorsey J. Poster Presentation: Linking antenatal and postnatal care, maternal health and nutrition knowledge, and behavior among women in the Policy and Science for Health, Agriculture, and Nutrition (PoSHAN) Community Studies in Nepal at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 19, 2014
10. Fitch C. Poster Presentation: Is Diversity in Agricultural Production Linked to Dietary Diversity Among Nepalese Women? Findings from the PoSHAN Community Studies at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 19, 2014
11. Biehl E. Poster Presentation: Does Amount and Kind of Food Bought by a Household Vary by Indices of Wealth in Nepal? at the 3rd Scientific Symposium: 'Agriculture, Food Systems and Nutrition: Connecting the Evidence to Action' in Kathmandu, Nepal on November 19, 2014
12. Klemm R, Manohar S. Insights on how agriculture might influence improved health and nutrition at the Graduate Nutrition Seminar at JHSPH, Baltimore, MD on December 2, 2014.
13. Manohar S. PoSHAN Community Studies: An Overview and Key Findings from 2013 and 2014 at meeting to discuss the design of the Suahaara follow-on with Mary Ann Anderson, BK Subedi and USAID/Nepal Mission on January 9, 2015.
14. Manohar S. PoSHAN Community Studies: An Overview and Key Findings from 2013 and 2014 at meeting to describe project to new USAID/Nepal Mission FFP team on January 30, 2015.
15. Manohar S, Sapkota D. Nutrition Innovation Lab & the PoSHAN Study at M&E Workshop for FFP Community Resilience Programs in Kathmandu, Nepal on February 6, 2015.
16. Fitch C. Linking Agriculture with Health and Nutrition in Nepal at US Borlaug Fellows in Global Food Security AAAS Conference, San Jose on February 13, 2015.
17. Manohar S. Findings from PoSHAN: a national study examining the linkages between agriculture, food security and undernutrition at TOPS Knowledge Sharing Event: Asia Region: Learning from the Past, Shaping the Future in Dhaka, Bangladesh on March 3, 2015.
18. Fitch C. Linking Agriculture with Health and Nutrition: Findings from the Policy for Science, Health, Agriculture, and Nutrition (PoSHAN) Community Studies and a Barriers Analysis of Interdisciplinary Research in Nepal at Johns Hopkins Center for a Livable Future Staff Meeting, Baltimore, MD on March 10, 2015.
19. Manohar S. PoSHAN Community Studies: An Overview and Key Findings from 2013 and 2014 at meeting to describe project to USAID Global Health, Washington, DC representative on March 12, 2015.
20. Fitch C. Poster Presentation: Is Diversity in Agricultural Production Linked to Dietary Diversity Among Nepalese Women? Findings from the PoSHAN Community Studies. Experimental Biology Conference in Boston, MA on March 28, 2015.
21. Dorsey J. Poster Presentation: Risk factors for child stunting in the Policy and Science for Health, Agriculture, and Nutrition (PoSHAN) Community Studies at the Borlaug Summer Institute in Indiana on June 2015.
22. West K. Nutritional Status in Mountains, Hills and Terai: PoSHAN at USAID-Nepal Mission in Kathmandu on July 23, 2015.
23. Adhikari R, Bhattarai S, Shrestha R, Manohar S, Klemm R, Gauchan D, West KP, PoSHAN Community Studies: Second Annual Panel Survey Summary Findings Brief, September 2015 (Nepali)
24. Klemm R. Farm to Fork: Insights on how agriculture might influence improved health and nutrition at the Graduate Nutrition Seminar at JHSPH, Baltimore, MD on September 22, 2015.

XIII) **Human and Institutional Capacity Development**

Number (By gender)	**Purpose**	**Home Institution**	**Training Institution/ Mechanism**	**Date**
Male: 142 (1st day), 104 (2nd day) Female: 88 (1st day) , 69 (2nd day)	3rd Scientific Symposium	Johns Hopkins University	National audience/ Symposium presentations	Nov 18-19, 2015
Male: 27 Female: 12	3rd Scientific Symposium–Student Session	Johns Hopkins University	National audience/ Symposium presentations	Nov 20, 2015
Male: 18 Female: 11	Dissemination of Borlaug student projects based on PoSHAN data	Johns Hopkins University	NARC/Presentations	Nov 2, 2015