

Annual Report
Purdue University
Year 4 (2013-2014)
Feed the Future Nutrition Innovation Lab-Asia

Principal Investigator:

Gerald Shively
Purdue University, Department of Agriculture Economics
403 West State Street
West Lafayette, IN 47907
Email: shivelyg@purdue.edu

Objective 1 (as stated in Year 4 Implementation Plan): Research

Understand and measure the connections between agricultural capacity, technology adoption, nutrition outcomes, and conditioning factors at levels of aggregation ranging from household-to-district levels. The key objective is to 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 agriculture and nutrition policy in Nepal and elsewhere.

Substantial progress achieved and efforts continuing. Details below.

Specific Objectives (as stated in Year 4 Implementation Plan): Data Collection

No primary data collection (survey) activities were undertaken in Nepal during the year. 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 available to us consists of approximately 40,000 data points representing monthly observations of agricultural prices over the period 1998-2011. During the year, we will be designing and implementing an analysis of these data.

Specific Objectives (as stated in Year 4 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, and chronic and widespread child malnutrition. 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 Specific Objectives

Focal area: *Discrete socio-economic analysis*

Activity 1: Current efforts 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 4, we made substantial progress on several fronts and have achieved momentum on analysis and writing. Keeping with our goal to develop useful data and make these data available to other members of the NIL research team, we released an analysis-ready dataset to project partners. We have developed a pipeline of research papers, some of which are now in peer review, and some of which are in working paper form. Two MS theses were completed and a PhD dissertation is underway. A partnership with a graduate student at Tribhuvan University was successfully completed.

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 four 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. In addition, we have undertaken an analysis

of the 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.

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 University in August 2012. Mr. Thapa successfully completed and defended his PhD prospectus in 2014. Professor Patrick Webb (Tufts University) is serving as an outside committee member for Mr. Thapa. We are working to position Mr. 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 University in May 2013. She worked extensively with Nepal DHS and NLSS data and recently joined the International Food Policy Research Institute (IFPRI) in Washington, DC. 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. An additional Purdue MS student, Tim Smith, participated in NIL Nepal research and completed his thesis in 2014. His participation was provided by cost-sharing to the project by Purdue University.

Lessons learned and challenges in implementing proposed activities

Identifying well-prepared host-country students for graduate degree training in the US has been a significant challenge. From a logistical point of view, early project delays and the substantial investment in student recruitment, screening and processing has meant that we are likely to train only a single Nepalese student at the PhD level in this phase of the project.

Solutions/resolutions applied or to be applied

We have made a commitment to support Mr. Thapa and it is essential that we maintain continuity of funding to support him through completion of his degree. If the NIL project ends before he completes his degree, we may need to hold budget in reserve and explore options for a no-cost extension beyond 2015.

Outputs (not previously or elsewhere reported)

Smith, Timothy and Gerald Shively. "Household vs. community determinants of child nutrition: a multilevel regression approach for Nepal." In review at *Food and Nutrition Bulletin*.

Leveraging and Cost-Sharing

Substantial leveraging for Year 4 Work Plan activities in Nepal came in the form of NASA support for our collaboration with Dr. Molly Brown at NASA. While it is not possible to put an exact dollar amount on the value of this leveraging, Dr. Brown has 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

Among our tasks is to work with agricultural market price data from districts indicated in Figure 1 below. These have been combined with DHS data on child growth outcomes to provide insights into how patterns of short-and long-run nutrition outcomes align with levels and changes in agricultural prices and other features of Nepal's economy. We have also combined these data with information from a range of sources on factors relevant to the functioning of agricultural markets, including construction of roads and bridges, agricultural production, population, fuel prices, etc. Figure 2 illustrates the district-level association between bridge density (in 2006) and district average height-for-age Z-scores (in 2011).

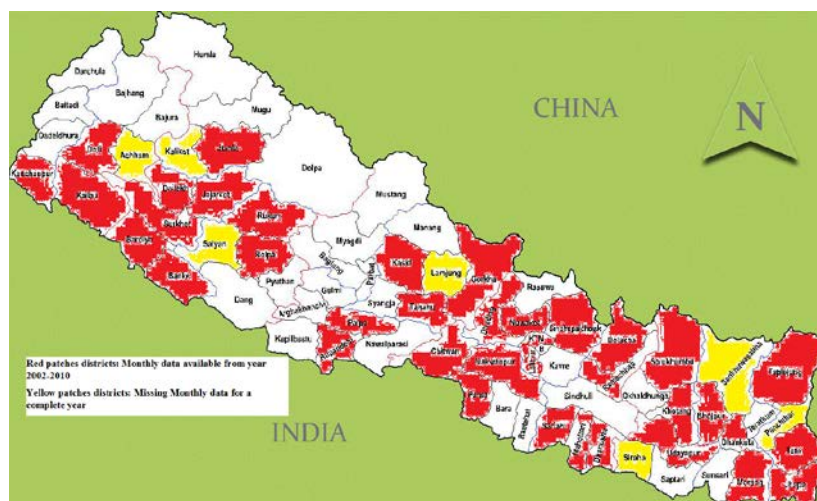


Figure 1. Map of districts with agricultural market price data

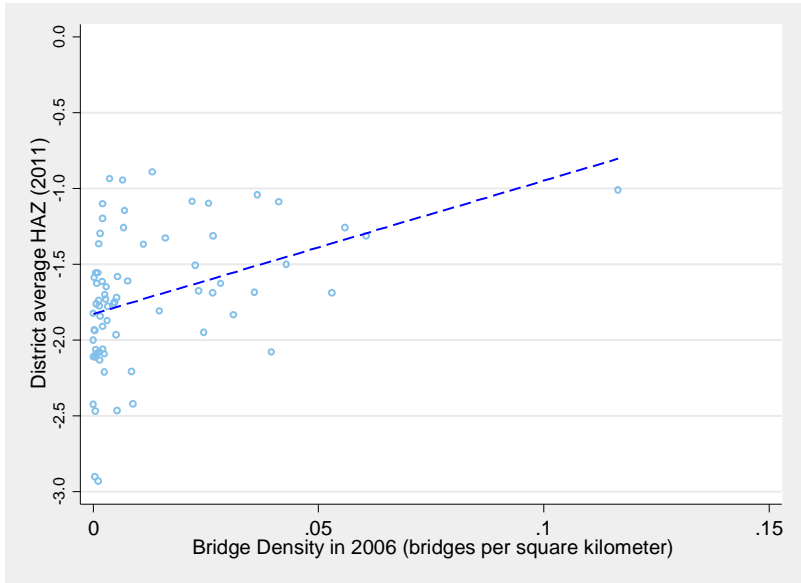


Figure 2. Bridge density and stunting in Nepal

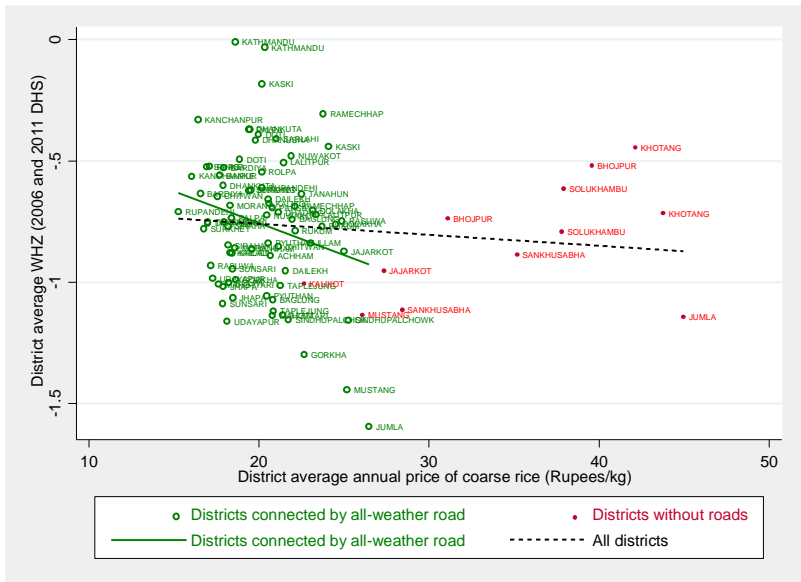


Figure 3. Rice prices, roads and child weight-for-height in Nepal

Annual Report
Johns Hopkins Bloomberg School of Public Health (JHSPH)
Year 4 (2013-2014)
CORE & RFA Activities: Nutrition Innovation Lab-Asia

Principal Investigator: Dr. Keith West

Co-Principal Investigators: Dr. Rolf Klemm, Ramesh Adhikari & Devendra Gauchan

Co- Investigators: Swetha Manohar, Ruchita Rajbhandary & Raman Shrestha

JHSPH Technical Advisory Committee Members: Dr. Rolf Klemm & Dr. Keith West

List of Countries JHSPH operates in: 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, MoHP

Overall Objective:

To build capacity and conduct research to evaluate agricultural and nutritional interventions whose delivery and integration may help communities and households be more food secure, better nourished and healthier early and later in life.

I) Program Activities and Highlights

Fiscal Year 2013-2014 was focused on the conduct of the second panel and first rounds of seasonal data collection, analysis of data from the first panel round, setup and establishment of sentinel site teams.

II) Key Accomplishments

- Trained 90+ data collectors, quality control and research assistant staff to conduct the second annual panel survey in 21 districts, April 2014.
- Completed data collection for the second annual panel assessment in 21 districts (approximately 5408 households interviewed), May-August 2014.
- Completed data entry for the first annual panel survey, development of a master database using the SQL server in Kathmandu to house PoSHAN data, analytic datasets created and shared among co-investigators for data analysis, October-November 2013.
- Completed data collection for the two rounds of seasonal sentinel site assessments in three districts in September-October 2013 and January-February 2014. (Approximately 552 and 499 households in sentinel seasonal Round I and Round II, respectively.)
- Completed data cleaning and entry of the data collected from the two rounds of seasonal sentinel site assessments. Seasonal Round I: November-December 2013; Seasonal Round II: March-April 2014.
- Completed analysis and drafting papers utilizing the first panel survey data:
 1. Undernutrition among Preschool-Aged Children in Nepal: A Nationally Representative Assessment;
 2. Feeding Practices among Children Less than Two Years of Age in Nepal;
 3. Maternal Diet and Dietary Diversity across Agro-Ecological Zones in Nepal;

4. Nutrition Status of Women of Reproductive Age in Nepal: Findings from a National and Sentinel Site System in Nepal;
 5. A National Surveillance and Sentinel Site System to Assess and Monitor Agriculture-to-Nutrition Pathways in Nepal: Design and Methods;
 6. Baseline Report of Panel 1 PoSHAN Community Studies;
 7. The Quality of a Woman's Diet but not Her Nutritional Status are Associated with Household Food Insecurity in Rural Nepal;
 8. Morbidity Burden of Women in Nepal from the Three Agro-Ecological Zones;
 9. Household Income and Female Empowerment as Determinants of Household Food Expenditure in Nepal; and
 10. Influence of Household Crop Diversity on Women's Dietary Diversity in Nepal.
- Provided technical input for the development of national-level policies/strategies supporting maternal and child nutrition and; guest lectures at national academic institutions.

III) Research Program Overview and Structure: PoSHAN Community Studies

Improved agriculture can affect processes that lead to food security, adequate dietary intake and 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 classify these connected pathways, and to address their modifiable components in order to reduce food insecurity and undernutrition in high-risk populations, and guide programs and policies which seek to 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 with measures of agricultural diversity, local market food prices and exposure to agricultural and microeconomic extension, nutrition and health programs in Nepal.

The PoSHAN Community Studies was conceptualized and designed by JHSPH with co-Principal Investigators (PIs) from NARC and IOM and the study has been fielded by New ERA Pvt. Ltd and NTAG. Data housing, management and analysis is overseen and conducted by JHSPH.

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

Achievements founded on proposed and actual activities based on Year 4 Work Plans and Lessons Learned

Section 1: Research Activities

Objective 1. 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
<ul style="list-style-type: none"> • Set up three sentinel site offices. • Secure transportation for data collection teams in sentinel sites. • Conduct two rounds of seasonal data collection in selected surveillance sites. • Initiate and complete data cleaning, checking and entry process. • Conduct analysis for annual panel survey (2013) and seasonal data collection periods (September-October 2013 and January-February 2014), linking data for further analysis. • Commence paper writing for analysis conducted on data collected during the first year of data collection (May 2014). • Conduct qualitative study on determining reasons for program participation and uptake. 	<ul style="list-style-type: none"> • Fully functional and operating field offices have been set up and are running in Jumla, Arghakhanchi and Banke. • Based on the needs of the study sites, transportation was secured: bicycles for Banke, porters for Arghakanchi porters and no transportation for Jumla. • Completed in September-October 2013 and January-February 2014, respectively • Sentinel site data from Rounds I & II have been cleaned, entered and stored on main SQL server database. • Baseline data has been analyzed and a baseline report created for the first annual panel data. Both descriptive and further analyses have been conducted. • Based on the analyses conducted, results have either been drafted into publications and/or into presentations shared at meetings and international conferences. • Not completed.
Lessons Learned	

- Transportation needs varied from site to site. In Banke, based on the terrain and preference of the staff, bicycles were purchased. In Arghakanchi, study wards are spread far apart scattered amongst the hills and at a distance from the field office. Thus, it was decided that during data collection, porters were the most efficient and useful aides for transporting anthropometry equipment through the hills. In Jumla, due to the terrain and the proximity of the wards from the VDC headquarters where the office is located and the teams reside, no transportation was required to be purchased.
- Transportation from Kathmandu to sentinel sites can be expensive, especially to Arghakanchi (on average USD 100/day for a car and driver, not including fuel costs) and the project would benefit from its own vehicle.
- There continues to be a need to engage and secure district-level officials' buy-in to the research to ensure that support is provided to the research project as a whole and the community-based field teams. This is especially important as we continually visit communities for data collection. Over time, this could result in interviewee fatigue to especially since this is not a trial providing an intervention.
- Real-time supervision quality control checks conducted by field supervisors would improve timely feedback to supervisors and enumerators especially during the short data collection periods for seasonal rounds.
- Tokens may need to be rethought to provide a different token of appreciation to respondents, perhaps something longer lasting than soap, toothbrushes and toothpaste.
- There is a need to keep up regular team-building activities to ensure a sense of cohesiveness within and between the sentinel site teams but also with the Kathmandu central office.
- Certain qualitative studies would benefit both national and global audiences, specifically understanding the difference of adopters versus non-adopters of agricultural technologies, improved practices as well as optimal health and nutrition behaviors. However, to conduct this qualitative study, further analyses of the first annual panel survey data had to be completed in order to inform such a study.

Solutions/Resolutions

- Transportation for the sites were secured based on need. A USAID vehicle has been available to the Kathmandu central office for transfer without expense. A request has been forwarded to the Management Entity (ME) to secure this vehicle.

- Sentinel site field supervisors regularly touch base with district officials needed 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 that 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.
- Test the use of mobile technology for quality-control management in the sentinel sites.
- Nail cutters and towels have been purchased for the third round of sentinel site data collection.
- Team-building activities for the sentinel sites were held during the retraining sessions in August 2014. It was necessary for frequent calls to be made by the senior field manager from the Kathmandu central office.
- Analyses of the first panel data to inform a qualitative study of the differences between adopters and non-adopters is currently underway and is slated to be completed in the upcoming Fiscal Year 2014-2015.

*Note: All steps noted above are carried out in collaboration with NTAG.

Objective 2. Conduct second annual panel survey for PoSHAN (Policy and Science for Health, Agriculture and Nutrition) Community Studies

PROPOSED	ACTUAL
<ul style="list-style-type: none"> • Pretest newly-developed modules to be included in the annual survey instrument. • Purchase and complete maintenance of equipment required for annual survey (height boards, Hemocue machines, tape measures, calipers, scales). 	<ul style="list-style-type: none"> • Not required, as full modules are not developed. Additional questions were pretested amongst study staff. • Purchased 44 Shorr Boards and 34 SECA scales for use during the second annual panel survey.

<ul style="list-style-type: none"> • Develop training manuals, manual of operations and survey implementation plan with New ERA. • Conduct training for data-collection teams with New ERA. • Conduct second annual panel survey data collection in 21 PoSHAN Community Studies sites. • Initiate and complete data cleaning, checking and entry process. • Analyze data from second annual panel survey. 	<ul style="list-style-type: none"> • An updated manual of operations, PowerPoints as training aids and a training schedule were developed. In collaboration with New ERA Pvt. Ltd., a survey implementation plan was developed. • 5 weeks training and standardization of 90+ data collectors in collaboration with New ERA. • Data collection started in May 2014 for the second annual panel survey in 21 districts of Nepal in the mountains, hills and terai and was completed in August 2014. • Quality assurance visits to all 21 districts completed by Nutrition Innovation Lab/JHU staff and to all districts by New ERA staff. • Preliminary data reviewed–frequency distributions completed. • Data currently being entered (August 2014). • Planned for October 2014 once data entry is completed by New ERA, transferred to JHU database and analytic datasets prepared. • Analytical plans for the incoming data have been discussed collaboratively between the Tufts and JHU teams.
<p>Lessons Learned</p> <ul style="list-style-type: none"> • A mapping of the VDCs would help with identification of households eligible for follow-up in the PoSHAN Community Studies. • There have been changes in how some of the VDCs that were randomly selected to serve as PoSHAN sites are being characterized–i.e. some of the 	

VDCs are moving from being characterized as a “VDC” to being a “municipality.” In addition, some wards are being merged with others, and thus their boundaries are expanding. This includes our sentinel site in the mountains, Mahatgaun in Jumla, which will soon be a “municipality”/urban VDC. These changes have not yet taken effect.

- It was noted that there was an approximate 25% inflation in the number of households interviewed. There are some explanations for this, which include: in-migration within the VDCs bordering India, households splitting and also the fact that we decided to expand our inclusion criteria to revisit children who were eligible for the first annual panel survey this year if they were up to 71 months of age. The total number of households interviewed is still crude and final numbers can be ascertained once data entry and cleaning is completed.
- It was noted by field teams that perhaps having a logistics assistant/porter to help transfer anthropometric materials between households would be more efficient.
- Enumerators reported during debriefing sessions that some respondents requested different tokens of appreciation for participation in the survey.
- For first rounds of panel data collection, New ERA was able to provide height boards, scales and HemoCue machines that they received during the 2011 DHS. However, the equipment is old and some is not functional. (Hence the purchase of anthropometric equipment for this year’s panel survey.)
- The partnership shared with New ERA and their data collectors continues to be valuable. However, there was turnover in some of the staff hired through New ERA for this project. There exists a need to have more continuity with staff to allow for less intensive training periods which could then be focused more on community building and innovative quality control measures.
- Overall, the refusal rates for the study still continue to be low. Most households or individuals have been lost to follow up due to seasonal migrations, because they moved away from the study site or because they aged out of the study.

Solutions/Resolutions

- Efforts are being undertaken to utilize GIS technology to map our study sites.
- The JHU team in-country has begun discussions with district level officials to identify the timeline for ward boundary changes and as well as the timeline for redefining VDCs/municipalities to predict how this will affect the PoSHAN Community Studies which may have sample size (an increase) and costs

- implications.
- Continue working with New ERA to carry out the annual surveys for the PoSHAN Community Studies.
 - In conjunction with New ERA, ensure that a plan is developed which allows for the greatest efficiency for enumerators to operate.
 - Use Eurotrol to test all of New ERAs and use HemoCue machines to ensure their accuracy.
 - Ongoing discussions about questionnaires and ensuring community engagement in the research continue. Simple pamphlets with research findings are planned to be developed for distribution to the community during dissemination efforts.

Objective 3. Disseminate findings from PoSHAN Community Studies research conducted by JHSPH to pertinent stakeholders.	
PROPOSED	ACTUAL
<ul style="list-style-type: none"> • Dissemination meeting with key stakeholders (policymakers, program implementers, researchers within national research institutions) for Year 1 findings 	<ul style="list-style-type: none"> • Drafted and published Proceedings from the 2nd Annual Scientific Symposium conducted in Kathmandu, Nepal on August 13-14, 2013. The Proceedings distilled and synthesized findings and key points from the 15 oral and 11 poster presentations that addressed the complex and evolving linkages between agriculture, market dynamics and food storage techniques, other nutrition-sensitive interventions and household food security, health and nutrition outcomes. Digital copies of the Proceedings were made available to all participants as well as to other stakeholders. • Presented “Insights into the linkages between horticulture, diet and nutritional status” from the PoSHAN community studies at the July 9 Horticulture

	<p>Innovation Lab on “Horticulture: Key Opportunities for Nutrition” in Washington, DC.</p> <ul style="list-style-type: none"> • Presented a “Brown Bag” talk on “Farm to Fork: Leveraging agriculture for improved health and nutrition in Nepal” at the USAID-funded SPRING project headquarters in Rosslyn, VA on March 12, 2014. • Central level dissemination meeting on baseline findings held on February 18, 2014 at the Child Health Division, Department of Health Services with 25 participants in attendance with representations for the Ministry of Health and Population, Ministry of Agriculture, National Planning Commission, Child Health Division, USAID- Mission, and academia. • PowerPoint with a sample of preliminary findings shared with USAID-Mission and Mission Director via Hari Koirala, Senior Nutrition Specialist, on December 20, 2013. • Baseline findings shared with the National Nutrition Group, an organization consisting of implementing partners and donors working on nutrition issues in Nepal, on April 9, 2014. • Presentation on the design and baseline results of the PoSHAN Community Studies at the Innovation Lab Council meeting on March 13, 2014, held in Nepalgunj which included other Innovation Lab scientists, local agricultural scientists and program implementing partners, USAID-Mission staff • Dissemination meeting of baseline
--	--

<ul style="list-style-type: none"> • Dissemination meetings with district level officials in sentinel sites. • Short research findings briefs provided to PoSHAN community 	<p>findings and further analyses performed with USAID–Mission. In attendance was the Director of Health, Deputy Director of Health and Nutrition Section staff on August 12, 2014.</p> <ul style="list-style-type: none"> • Dissemination briefs on the baseline data from Panel I were sent to the district health, agriculture and livestock offices as well as to the District Development Committee office in each of the 21 PoSHAN districts in August 2014. • Dissemination meeting held with Suahaara program personnel to review findings of Panel I pertinent to the program in September 2014. • Dissemination meetings were held in each of the sentinel sites with representatives from the district health, agriculture and livestock offices as well as the District Development Committee, Local Development Office in September 2014. • Not completed
<p>Lessons Learned</p> <ul style="list-style-type: none"> • Dissemination meetings thus far have sparked a great deal of interest and comments from stakeholders. There has been both interest in the cross-sectional findings as a way of getting an up-to-date snapshot of status, dietary patterns, production, market prices, household food security and health/nutrition/agricultural extension worker reach. Much interest has been expressed in reviewing year-to-year differences as ongoing intensification of several health, nutrition and agricultural programs continue. Further, there have been requests for analyses of disaggregated data from certain districts where specific programs in existence to provide an illustration of program uptake and nutritional status indicators of women and children. It has been important to explain clearly how to interpret disaggregated data given how the study was designed and the sampling strategies utilized in the PoSHAN study. 	
<p>Solutions/Resolutions</p> <ul style="list-style-type: none"> • Once data from the 2nd Annual Panel survey have been entered and cleaned, 	

analyses will begin on year-to-year differences.

- Ongoing analyses to provide data which is useful to ongoing programs on an as-needed basis with clear interpretation of results presented.
- Three (3) PoSHAN briefs on further analyses conducted on the first annual panel survey data are being drafted by the three JHU MSPH students who are currently working with PoSHAN Community Studies for their practicum.

Objective 4. Identify new research questions that might be addressed using the PoSHAN surveillance site infrastructure, and define, prioritize and identify institutional roles with respect to the analysis and publication of findings from PoSHAN data.

PROPOSED	ACTUAL
<ul style="list-style-type: none"> • Participate in and prepare for a meeting to update and solicit feedback on the status and progress of the surveillance system, identify ideas for potential nested sub-studies, and plan priority analyses and publications 	<ul style="list-style-type: none"> • Participated in three analytic priorities with Tufts University and other collaborating partners (Harvard and Purdue) on December 20, 2013 (conference call), April 22 & 23, 2014 (meeting held at JHSPH), and on August 1, 2014 (conference call). • Dr. William Masters of Tufts University has been engaged and is working in collaboration with JHU to provide input on the creation of household economics and production variables. • Preliminary discussions with Dr. Nandakumar of Virginia Tech have been undertaken to evaluate the potential of collaborating on the gut microbiome study in JHU sentinel sites.

Lessons Learned

- There remains a need to keep track of and to maintain contact with alumni of the training programs to engage them on a regular basis—they provide a wealth of knowledge, and in some cases, belong to or are attached to the stakeholder community which we hope to engage in disseminating our research.

Solutions/Resolutions

- A training candidate who currently serves as a public health scientist with the Nutrition Innovation Lab/JHU team has been tasked with conducting regular alumni meetings with previous training candidates.
- Ongoing discussions are underway to assess the analytic capabilities and interests of training candidates. Despite not being engaged directly in the data collection for the PoSHAN studies, these candidates may be able to be engaged for the analysis of data from the study.

Section 2: Capacity Building

Objective 1. Help build capacity to conduct population-based nutrition research.

PROPOSED	ACTUAL
<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• Quarterly meetings have not been conducted, but instead, lines of communication have been maintained via email, telephone calls and meetings (not on a quarterly basis). One training candidate who works with the Child Health Division was an integral part of organizing the dissemination held at the Department of Health Services.• Both training candidates from the Institute of Medicine are engaged in the design of and abstract evaluation for the Scientific Symposium to be held in November 2014.• The Nepali candidate identified and supported by the Nutrition Innovation Lab to pursue a Masters of Public Health has matriculated from the degree program and now serves as a public health scientist for Nutrition Innovation Lab research activities.• A NTAG staff member was identified as having training needs in anthropometry, anemia testing and a general need for exposure to community research sites. This staff member visited Sarlahi for one

	<p>week and was provided training and mentoring by senior field supervisory staff.</p> <ul style="list-style-type: none"> • A lecture on “Nutrition Surveillance and Nutrition Program Monitoring and Evaluation” was given to the MPH class at the Institute of Medicine, Tribhuvan University, Kathmandu, Nepal on August 12, 2014.
<p>Lessons Learned</p> <ul style="list-style-type: none"> • There remains a need to keep track of and stay in contact with alumni of the training programs to engage them on a regular basis—they are a wealth of knowledge, and in some cases, belong to or are attached to the stakeholder community which we hope to engage in disseminating our research. • There exists a limited pool of public health nutrition researchers in Nepal who can provide technical input to ongoing research activities in the country. 	
<p>Solutions/Resolutions</p> <ul style="list-style-type: none"> • A training candidate who currently serves as a public health scientist with the Nutrition Innovation Lab/JHU team has been tasked with conducting regular alumni meetings with previous training candidates. • Ongoing discussions are being held to assess the analytic capabilities and interests of training candidates. Despite not being engaged directly in the data collection for the PoSHAN studies it might be possible to engage these candidates for the analysis of data from the study. • Based upon the popularity of the Scientific Symposium, funds were secured from the USAID-Mission to conduct the 3rd Annual Scientific Symposium—to be held November 18, 19, and 20. The last day will focus on a student session and a “What is Evidence?” workshop (organized by Tufts University). • Provide technical input (especially with regard to sampling and data to be collected) to the National Nutrition Surveillance Working Group which is focused on the creation of a national nutrition surveillance system. • Contribute to the Maternal Health Sector Strategy Working Group (Monitoring & Evaluation core group). • Shared PoSHAN questionnaires with RIDA, a research firm focused on Feed the Future monitoring and evaluation activities. • Shared PoSHAN questionnaires and provided training on how to conduct food frequency questionnaires to Helen Keller International who was 	

developing monitoring tools for their Homestead Food Production program

IV) Presentation and Publications:

1. PoSHAN Community Studies Manual of Operations, Updated, Year 2
2. PoSHAN Community Studies Manual of Operations, Sentinel Sites, Year 1 & 2
3. PoSHAN Community Studies Annual Panel Survey (P2) Data Management Plan
4. PoSHAN Community Studies Analytic Database in STATA for sentinel site rounds
5. Shrestha R, Manohar S, Klemm R. Proceedings-Science and Policy for Health, Agriculture, Nutrition & Economic Growth. Nutrition Innovation Lab, December 2013
6. Adhikari R, Bhattarai S, Shrestha R, Manohar S, Klemm R, Gauchan D, West KP, PoSHAN Community Studies: Baseline Summary Findings Brief, August 2014 (Nepali)
7. Manohar S, Klemm R, West KP et al. Baseline Summary Report: 1st Panel Annual Panel Survey 2013: Policy and Science of Health, Agriculture and Nutrition (PoSHAN) Community Studies, August 2014
8. Klemm R. Frameworks for Anemia Programming for Women & Children: Unpacking Causal & Program Pathways. Multisectoral Anemia Partners Meeting, Washington DC
9. Klemm R. "Farm to Fork: Leveraging agriculture for improved health and nutrition in Nepal" at "Brown Bag" session for the USAID-funded SPRING project staff at SPRING headquarters in Rosslyn, VA on March 12, 2014
10. Manohar S, Shrestha R, Rajbhandary R, Klemm RDW, Gauchan D, Adhikari R, Webb P, Ghosh S, West KPW Jr. Risk Factors for Anemia and Undernutrition Across the Agro-Ecological Zones of Nepal. Poster. June 2014. Micronutrient Forum 2014, Ethiopia
11. Klemm R. PoSHAN Community Studies, Nepal—Insights into the linkages between horticulture, diet and nutritional status, Horticulture Innovation Lab's Meeting: Horticulture for Key Opportunities for Nutrition, Washington DC. July 9, 2014
12. Manohar S, Shrestha R, Gauchan D, Adhikari R, Klemm R, West Jr, K. Policy & Science for Health, Agriculture and Nutrition (PoSHAN Community Studies), Nepal. Poster. 7th Annual George Graham Lecture & Symposium: "Micronutrients for Life throughout Life."
13. Klemm R, West KP, Manohar S. PoSHAN Community Studies: Finding pathways to accelerate nutritional impacts, Nutrition Innovation Lab: Research on Agriculture, Health and Nutrition International Congress on Nutrition, Sept 15, 2013

V) Human and Institutional Capacity Development

Number (By gender)	Purpose	Home Institution	Training Institution/ Mechanism	Date
Male: 35 Female 5	Provided second year MPH students on "Nutrition Surveillance, Program Monitoring & Evaluation"	Johns Hopkins University	IOM; Lecture	August 12, 2014.

VI) Other

- Three JHSPH Masters of Public Health students are currently completing practicums with the Nutrition Innovation Lab-Nepal and are based in Kathmandu for six months. Erin Biehl and Claire Fitch received funding from the US Borlaug Fellows Program in Global Food Security. The students' fellowship required existing collaborations with local academic/research institutions and they were able to utilize the Nutrition Innovation Lab's collaboration with the Nepal Agricultural Research Council (NARC) for this fellowship. One of their in-country advisors is Dr. Devendra Gauchan, Division Chief of the Socioeconomics and Agricultural Research Policy Division at NARC (also co-PI of the PoSHAN Community Studies).

The fellows are each conducting key informant interviews: one focused on seeking to identify barriers to cross-disciplinary research in the fields of agriculture and nutrition; and the other on exploring how non-government organizations use academic research to design agriculture and nutrition interventions. For these key informant interviews, the students are working with Manu Magar, a NARC scientist with the biotechnology department, and Padma Pokharel, a second year MSc student in Agricultural Economics at Tribhuvan University who is currently interning with NARC.

Both students have also undertaken quantitative analyses for the project working on the costs of a typical diet across the agro-ecological zones, expenditure patterns across agro-ecological zones and exploring relationships between household crop diversity and individual women's dietary diversity.

- Jamie Dorsey is funded by the Sight & Life Foundation and is currently conducting analyses on antenatal and postnatal program exposure in women who have been pregnant in the past year and its association to health and nutrition knowledge and practices. She has also been collaborating with Dr. Ramesh Adhikari (co-PI) to develop a qualitative study to understand the 'whys' of health and nutrition program uptake, knowledge and behavior among women and has also been exploring collaborations with the Suaahaara program to undertake the development of a similar qualitative study protocol specific to their program.

Annual Report
Helen Keller International
Year 4 (2013-2014)
Feed the Future Nutrition Innovation Lab-Asia

Management Entity Information

Founded in 1915 by Helen Keller and George Kessler, Helen Keller International (HKI) is among the oldest international NGOs (non-governmental organizations) devoted to preventing blindness and reducing malnutrition in the world. HKI currently work in 22 countries: 13 in Africa and eight in 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 United States Agency for International Development (USAID) funded five-year integrated nutrition and health program called "Suaahara," which was started in September 2011 in collaboration with Save the Children, Johns Hopkins Bloomberg School of Public Health Center for Communication Programs, JHPIEGO, Nepal Water for Health (NEWAH), Nepali Technical Assistance Group (NTAG) and National Planning Commission (NPCS).

Currently HKI Nepal is also working on two Innovation Lab activities: Livestock and Climate Change, with Utah State University (USU), and Policy and Science for Health, Agriculture and Nutrition (PoSHAN) Policy study with Tufts University. A recent series of studies "Assessment and research in child feeding (ARCH)" is primarily examining infant and young child feeding practices and product labeling, and promotion practices (violations) of commercially-produced breast milk substitutes and complimentary foods in Nepal, which is funded by the Bill and Melinda Gates Foundation. In addition, HKI is supporting the USAID-funded SPRING Project case study on "Pathways to Better Nutrition" which aims to explore how the Nepalese government prioritizes nutrition interventions and supports the implementation of its national nutrition plan to reach its chosen goals of reducing undernutrition.

PoSHAN research draws on national policies and large-scale, multi-sector 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, and Valley Research Group (VaRG), while the latter is led by JHU in partnership with NTAG and New Era. The research is supported by the National Planning Commission (NPC) and the Ministry of Health and Population (MoHP) Department of Health Services (DHS)/child Health Division (CHD) and is conducted in 21 randomly-selected field sites across Nepal. Key informant interviews using semi-structured questionnaires are conducted as part of the PoSHAN Process to analyze how a range of policies and programs are translated, from the design to the implementation phase, along a chain leading from central

(government) level down to the ultimate beneficiary (household) level in Nepal. Building on the ‘institutional readiness for change’ theory, and assessments of vertical versus horizontal integration as approaches to enhanced cross-sectoral coordination, the research plans to link metrics of institutional and individual collaboration at the central level with metrics of program fidelity at the local level.

List of Program Partners¹

PoSHAN process research is a joint collaboration between Tufts University and Patan Academy of Medical Sciences (PAHS). For the data collection and field activities, Valley Research Group (VaRG), Lalitpur, Nepal was contracted through HKI Nepal.

Acronyms

PoSHAN - Policy and Science for Health, Agriculture and Nutrition

VaRG - Valley Research Group

HKI - Helen Keller International

VDC - Village Development Committee

MSNP - Multi-Sectoral Nutrition Plan

NHRC - Nepal Health Research Council

PAHS - Patan Academy of Health Sciences

Suaahara – USAID-funded nutrition program

KISAN – Knowledge-based Integrated Sustainable Agriculture and Nutrition

BBNC- Bangalore Boston Nutrition Collaborative

CHD - Child Health Division

NPC- National Planning Commission

VI) Executive Summary

PoSHAN, which means “good nutrition” in Nepali, is an annual process research being undertaken in 21 sites across the mountains, hills, and terai of Nepal. The PoSHAN policy study is designed to understand processes that support nutrition program impact and focuses on generating rigorous empirical evidence to explain how and why large-scale, multi-sectoral policies and programs in nutrition achieve their goals (or not) in various settings.

The longitudinal prospective study consisting of three rounds of data collection involves analytical tests, including frequency checks and cross tabulation. Preliminary findings of Round I were shared with the different government and non-government stakeholders. Findings from the first round of data collection will be shared with the wider network of stakeholders during the scientific symposium in November 2014. Additionally, data will be made available at the various levels of government as research briefs.

¹ US universities and international partners by country.

Data collection for PoSHAN Round II, was the major activity conducted during this reporting period. Field enumerators were trained and mobilized for data collection on July 6, 2014. To date, data collection has been completed in 14 of the 21 districts.

Apart from the PoSHAN study, discussions and planning are underway for the “Aflatoxin study” and Suaahara operations study on frontline workers.

The Innovation Lab Council Partners meeting was another activity that took place in March 2014. The three-day workshop was held in Kathmandu, followed by a two-day field visit to different sites. The logistics were managed by HKI, who also accompanied the visiting parties on both trips.

VII) Program Activities and Highlights² – October 2013-August 2014

Preparation and management of the Round II survey was the major activity during this reporting period.

Preparation for Round II Data Collection

- **Agencies Contracted:** Scopes of Work (SoW) were prepared for two agencies contracted for Round II data collection. Based on the performance of Round I and the importance of maintaining continuity, HKI decided to contract VaRG for Round II. The study team decided to use electronic devices (tablets) this year. Different options were explored, feasibility was assessed and the decision was made to proceed with tablets. Neolinx was contracted for developing the front-end data collection tools (software app) for the survey and for providing technical input.
- **Refinement of Round II Instruments:** Round II instruments took a substantial amount of time to review and finalize. Instruments were finalized following series of meetings and discussion. Instruments were simultaneously translated to Nepali.

A Field Guideline was prepared for enumerators both in English and Nepali. The guideline was designed as a reference material that includes study details and procedures for the data collection activity. The final draft of the instruments was then field tested in two sites at different levels. An amendment letter was submitted to NHRC that included the change in instruments and the use of tablets.

- **Training and Data Collection:** A seven-day intensive orientation training was provided to the field teams for Round II data collection procedures

² Summary of program activities for the year, no more than one page in length.

before they were mobilized for the study. The first two days of training focused on the introduction to study, objectives of the survey and introduction to the tablets.

Practice interviews and role-play practice sessions were conducted, followed by two days of field practice and two days of feedback sessions. Enumerators were also evaluated based on the pre/post test. Monitoring visits were conducted to ensure the quality of the data-collection process. The HKI team visited different sites, observed the interviews and provided necessary feedback to the teams for improving their performance.

Dissemination of Round I Findings

- Study findings from the first round of data were shared with the government and other stakeholders in July 2014 at the Department of Health Services/Child Health Division.
- Three research briefs were developed based on analysis of the Round I data, appropriate to district interventions–MSNP, Suaahara and KISAN.

Get-Together Meeting

- An event was held to bring some of the BBNC candidates, who were supported for training in research methods to build a network among them and to share their experiences about the usefulness and skills gained from the training as well as to seek feedback and recommendation for the future training.

Nutrition Innovation Lab - Partners' Meeting

- HKI provided the logistical and on-site support for the Annual Innovation Lab Council Partners Meeting, called “Scaling Up Agricultural Research and Technologies and Designing Research for Improved Nutritional Outcomes,” from March 10-12, 2014, which was held at Hotel Shangri-La, Kathmandu, Nepal. HKI staff also accompanied on a visiting mission to the field sites in Nepalgunj, Banke, Thumpakhar and Sindupalchowk.

Aflatoxin Study

- For the upcoming Aflatoxin study, protocol was discussed in several meetings with the Tufts team and PaHS. Different modalities for the protocol, design, work plan and activities were discussed and a draft protocol was prepared for final review and revision.

VIII) Key Accomplishments³

Two major key accomplishments of this reporting period are mentioned below.

Completion of Round I Activities and Sharing of the Findings

- Data entry of approximately 700 open-ended questionnaires was a challenge. To accomplish this, different categories were developed, codes were assigned and information was entered. After the analysis, preliminary findings were shared with concerned stakeholders and three research briefs were developed. More research briefs from Round I findings are in pipeline.

Finalization of Round II Study Instruments and Mobilization of Field Team for Data Collection

- After several discussions and Skype meetings with the Tufts team in Boston, instruments for the second round of the PoSHAN survey were revised, refined and the final draft was prepared. The questions in the Round I data instrument included open-ended responses. The team decided to record responses in Likert scale this time, so finalization of the instrument took considerable time and effort. Electronic devices (tablets) were used for data collection for which the survey tool app was developed for android tablets and configured to all devices. After six days of intensive training, all six teams were successfully mobilized in the field for data collection.

IX) Research Project Reports⁴

(1) Name: PoSHAN Policy Process Survey

(2) Presentations and Publications

- Nutrition Innovation Lab Research Brief No. 15, July 2014 *“Governance of Nutrition Policies and Programming: Preliminary findings from PoSHAN process research in Nepal”*
- Nutrition Innovation Lab Research Brief No. 16, August 2014 *“Perception and Practices Relating to Nutrition among Decision-Makers at Suaahara sites of Nepal”*

X) Human and Institutional Capacity Development⁵

³ Concise statement of achievements, limited to one page in length that focuses on outputs, not process, such as Feed the Future indicators and distillation of program achievements across all program activities. Reporting on numbers of project meetings is not an output.

⁴ Summaries of project activities, highlights and outcomes, not scientific reports or long detailed research papers, no more than one page per project.

Training for the second round of PoSHAN was conducted over a seven day period (two additional days were included this year) from June 16-23, 2014.

Day 1 was spent introducing the Nutrition Innovation Lab, PoSHAN study (goals, objectives, methods, sites, etc.) and the district level questionnaire.

Day 2 began with a review of the first day, followed by a review of each question at the district level, explaining its objective and clarifying issues raised by the enumerators. Manuals explaining the questionnaire were used during the training. Tablets were introduced at the end of Day 2.

Day 3 began with a review of Day 2. We then explained the survey app and the use of tablets. The teams learned how to download the surveys from the server, fill it out, save and send it using the Ward level questionnaire. Various scenarios were enacted with troubleshooting complications included. The Ward Level questionnaire was explained highlighting differences from the other three levels and teams practiced using the tablets for the Ward Level questionnaire.

Days 4 and 5 were spent in the field interviews. A total of 26 interviews were conducted—10 at the district level with various officials (health, livestock, agriculture, women development, education, WASH); four at the Ilaka (or neighborhood) Level (head, health, and agriculture) (2); five at the VDC level (health); and seven at the Ward Level with Female Community Health Volunteer (FCHVs). We had a review session on the morning of Day 5 to go through any issues from the interviews on Day 4. The teams performed well despite a few glitches that were found on the survey app, which were duly remedied by Neolinx.

Day 6 included a post-training evaluation survey. The average score was 37 out of 43. We went through each question starting with those that scored the least. Following this exercise, each team spoke about their field experience, highlighting any challenges they faced with the survey questions, respondent's understanding of the questions posed to them, use of tablets, etc. The teams did mock interviews and we concluded the day re-administering the post-training evaluation survey. The average score this time was 40.5.

Day 7 started with a review of the post-training evaluation survey. The rest of the day was spent explaining reporting forms and formats (for the enumerators, supervisors, and coordinator), interview lists, and reviewing the data collection process once more.

⁵ This section is to serve as a compilation of all program training activities and is not meant to duplicate the Capacity Building section under individual Research Project Reports. It can be in chart format.



Annual Report
Heifer International
Year 4 (October 2013-September 2014)
Nutrition Innovation Lab-Asia

Submitted by:

Laurie C. Miller MD

Consultant, Heifer International

Professor, Department of Pediatrics, Tufts University School of Medicine

Adjunct Professor, Friedman School of Nutrition & Policy, Tufts

University

Adjunct Professor, Eliot-Pearson Department of Child Study & Human

Development, Tufts University

lmiller1@tuftmedicalcenter.org

laurie.miller@tufts.edu

1) Executive Summary

Heifer International received funding from the Nutrition Innovation Laboratory-Asia to pursue two projects in 2013-2015. These projects are both based in Nepal, and are carried out in close collaboration with Heifer Project Nepal. The projects are described below, in addition to the progress achieved 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 Project Nepal from 2009-2011. The families resided in three districts in Nepal: Nawalparasi, Chitwan, and Nuwakot. The initial investigation was a two-year randomized, controlled trial on the effects of community-development activities (supervised by Heifer Project Nepal) on child health and nutrition. Project 1B was 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. This project was established in 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 intervention activities.

XI) Program Activities and Highlights

In order to conduct these activities, the memorandum of understanding (MOU) between Heifer International and the Nutrition Innovation Laboratory remained in place. Heifer also maintained a consultancy arrangement with Dr. Miller.

Project 1B. The following activities have been completed:

- a. Completion of field work and data collection.
- b. Data cleaning and data entry.
- c. Preliminary data analysis.
- d. Manuscript preparation completed, "Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition."
- e. Discussion and revisions with co-authors is underway, with anticipated submission by October 1, 2014.
- f. Manuscript preparation completed, "Head growth in rural Nepali children."
- g. Discussion and revisions with co-authors is underway, with anticipated submission by October 1, 2014.
- h. Manuscript preparation in process, "Food allocation choices in rural Nepali households."

- i. Manuscript planned, “Household animal resources and dietary diversity in rural Nepal” (analysis underway).
- j. Abstracts submitted to Nutrition Innovation Lab November 2014 meeting:
 - a. Growth and Health of Rural Children in Three 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 needed to NHRC.
- b. Progress reports and renewals submitted to Tufts University Institutional Review Board.
- c. Meetings were held to orient community leaders to project design and requirements, and to invite their participation.
- d. Community meetings were held to introduce citizens to project design and requirements, and to invite their participation.
- e. Valley Research field staff collected baseline data in Banke district, including 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 1300 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 1057 mothers interviewed (some conjoint households had >1 eligible mother).
- f. After baseline survey, Heifer field teams began work with the Full Intervention group as well as the Training-Only group.
- g. Valley Research returned to the field for Round 2 of data collection. Overall, this was successful although some people (72) from the initial survey were not able to be included in Round 2 of data collection. The reasons are shown below.

Reasons: Dropped out of group	Number
Opposed by family member/husband	23
Lack of time/busy with household chores	3
Was away from home at the time of orientation	5
Not interested (due to the predominance of one specific ethnic group only)	6
Total	37
Reasons: Could not complete interview	Number
Gone to parent’s home	23
Gone to another house (in the hills)	5
Gone to India for husband’s medical treatment	1
Refused to participate in the interview	1

Migrated to other place	3
Death of eligible child	1
Went to India to work with husband	1
Total	35
Grand total	72

- h. Data from Round 1 was cleaned and entered.
- i. Data from Round 2 was cleaned and is in the process of being entered.
- j. Very preliminary analyses were done to verify cleaning, completion, and matching.

XII) Key Accomplishments

Project 1B

- a. Field work and data entry completed.
- b. Results have generated two to four manuscripts to be submitted within the next three to six months.

Project 2

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

XIII) Research Program Overview and Structure

These research activities have been conducted in collaboration with Heifer Project 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 values research as a means to inform their field activities and policies. As they are active in 31 countries throughout the world, research findings can be quickly disseminated into field practice, to benefit child health and nutrition outcomes in their project areas.

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 would increase with a longer duration of Heifer interventions. Alternatively, reduced benefits of Heifer activity on child nutrition could occur 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 activities on the outcomes of child health and nutrition 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 the most improvement in child nutrition.
- c. Identify characteristics of families and children who demonstrate the 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 Project 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 Griffiths).
- 4) Achievements: (a) Successfully completed data collection and child anthropometry to obtain 48 month results for 415 households in Nawalparasi, Nuwakot, and Chitwan. (b) Data analysis underway. (c) Two manuscripts in near-final form; submission anticipated soon. (d) Two manuscripts in preparation. (d) Initial results demonstrate that Heifer intervention improves many outcome measures (income, SES), but these outcomes may be mediated in part by maternal educational level (n.b.: these are still under analysis and should be considered preliminary and should not be released):
 - i) The percent of children with underweight decreased from ~50% to about 30% over four years. It is unclear if this is a general trend in the Nepali population or if it relates to the Heifer intervention.
 - ii) There was no statistical difference between either maternal education levels or SES at baseline between the two intervention groups. At baseline, there was a very mild positive linear relationship between female education and SES in both intervention groups.

- iii) In the Terai, in Intervention Group 2 (Control), households with better-educated mothers and/or with increases in animal score were associated with greater positive change in SES from birth to 48 months. (Animal score was not used to calculate SES.) This was confirmed with a regression analysis (without the animal score included).
 - iv) Households with more highly-educated women had more improvement in household income.
 - v) Mother's education does not seem to predict any changes in child growth scores (but we plan some additional analyses to address this further).
 - vi) Greater improvement in income was significantly associated with higher educational status in the group with the longest exposure to the intervention (Group 1).
- 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 Project Nepal office and field staff; and (d) Heifer 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; and (b) feedback from field enumerators can provide valuable insights into project success and candid assessments of interventions.
 - 7) Presentations and Publications:
 - a. Manuscript preparation completed, "Livestock interventions in rural Nepal: Effects on child health and nutrition."
 - b. Discussion and revisions with co-authors underway, with anticipated submission by October 1, 2014.
 - c. Manuscript preparation completed, "Head growth in rural Nepali children."
 - d. Discussion and revisions with co-authors underway, with anticipated submission by October 1, 2014.
 - e. Manuscript preparation in process, "Food allocation choices in rural Nepali households."
 - f. Manuscript planned, "Household animal resources and dietary diversity in rural Nepal" (analysis underway).
 - g. Abstracts submitted to Nutrition Innovation Lab November 2014 meeting:
 - (i) Growth and Health of Rural Children in Three 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 Project Nepal. However, the effect of the use of this curriculum on child growth is unknown. In addition, Heifer activities in Project 1A were not disaggregated with regard to specific animal husbandry training, provision of livestock, and community/social capital development. Heifer 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.

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 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 (total five surveys; 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 Project 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 Laboratory leadership (Dr. Patrick Webb, Dr. Shibani Ghosh, Dr. Jeffrey Griffiths).

- 4) **Achievements:** With the assistance of Valley Research, 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 1057 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. Data cleaning and entry have been completed for baseline, and nearly completed for Round 2.
- 5) **Capacity Building:** (a) Heifer Project Nepal office and field staff, as well as Valley Research team, have received training in Ethics of Human Subjects Research. (b) Heifer Project Nepal and Valley Research teams have received mentoring in conduct of longitudinal research. (c) Heifer Project Nepal and Valley Research team have received mentoring in statistical methods. (d) Nepali dieticians have been mentored in development of nutrition training curriculum.
- 6) **Lessons Learned:** We have encountered two problems which interfered with or most 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 is currently scheduled for November 2014, but at the end of August, 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. Although it is still more than two months away, it is unclear if the research teams will be able to work in November as planned, and it is also unclear what effect this natural disaster may have on the research outcomes.
- 7) **Presentations and Publications:** None to date.

III) Future Directions

Project 1A suggested that community development activities could have an indirect but significant effect on child growth. Project 1B was conducted to determine if these effects increased or decreased over time, as community-development support from an external agency (Heifer) was reduced in intensity. It was a unique opportunity to evaluate six communities before, during, and after intensive intervention activity, and assess household and child characteristics. It became clear that although some improvements in child nutrition were seen, many children in the project areas remained malnourished. However, notably, the percentage of children with underweight improved from ~50% to ~30%. It could not be determined if this was a direct effect of the Heifer activities alone, or if there was a general trend in Nepal during this time period.

Project 2 was designed to attempt to provide further (and more rapid) improvements in child nutrition via the introduction of a specific nutrition training curriculum. In addition, the study design will allow the separation of the effect of training activities provided with and without the context of community-development activities which promote social capital and women’s empowerment. The hypothesis is that nutrition training in the context of a holistic scheme to improve community development and family socioeconomic status is more effective than training provided without this context. Baseline and Round 2 data collections are now complete. Round 3 will be supplemented with the first field test of a child development assessment, for children ages 24-36 months. However, the recent mud slides in the region may compromise the ability of the field teams to conduct Round 3 as planned.

IV) Work Plan

Project 1B

Project 1B produced a large dataset describing 415 families over four years. In addition to child anthropometry, health, and educational status, the information includes detailed demographic material, land ownership, family wealth, animal resources, household composition, hygiene practices, and household infrastructure. The availability of this information over a four-year period makes it a valuable resource. We expect to utilize this dataset to complete additional scholarly papers addressing the multiple topics. The approach for each is shown in the table below:

Title	Analysis	Draft	Review with co-authors	Submit
Livestock Interventions in Rural Nepal: Effects on Child Health and Nutrition	Complete	Complete	Underway	Projected: October 2014
Head growth in rural Nepali children	Complete	Complete	Underway	Projected: October 2014
Food allocation choices in rural Nepali households	Underway	Partial		
Household animal resources and dietary diversity in rural Nepal	Underway			
Hygiene practices in rural Nepal: effect of a community development intervention	Planned			

Additional topics may be suggested by further analysis of the dataset.

Project 2

Project 2 is progressing well, although some local difficulties have been encountered. Political issues delayed the timing of Round 2 of data collection. The recent mudslides have been catastrophic for some VDCs and the effect of this on our research activity is not known at present. Without factoring in possible problems from the mudslides (this cannot be assessed completely at this moment), we plan the following for the upcoming rounds of data collection:

	Data collection	Data cleaning	Data entry	Preliminary analysis
Round 3	Nov 2014	Dec-Feb 2015	Feb-Apr 2015	May 2015
Round 4	May 2015	Jun-Aug 2015	Aug-Sep 2015	Oct 2015
Round 5	Nov 2015	Dec-Feb 2015-2016	Feb-Apr 2016	May 2016

Final analyses and draft manuscripts will be prepared between May-December 2016. Depending on results of preliminary analyses, earlier manuscripts may be prepared based on interim results.

In addition, a collaboration was developed with colleagues at the Harvard School of Public Health (HSPH) to investigate the developmental status of a subset of children in this project area. The status of this project and full report were submitted to HSPH for inclusion in their year-end report to NIL. Please contact us with any questions about the status of this project or any of our work. We thank you for your ongoing support.

Respectfully submitted,

Laurie C. Miller, M.D.

Consultant, Heifer International

Professor, Department of Pediatrics, Tufts University School of Medicine

Adjunct Professor, Friedman School of Nutrition & Policy, Tufts University

Adjunct Professor, Eliot-Pearson Department of Child Study & Human Development, Tufts University

Annual Report
Harvard School of Public Health
Year 4 (2014)
Feed the Future Nutrition Innovation Lab-Asia

Principal Investigators:

Wafaie Fawzi, MBBS DPH
Harvard School of Public Health
665 Huntington Ave
Boston, MA 02115
Email: mina@hsph.harvard.edu
christopher.duggan@childrens.harvard.edu

Christopher Duggan, MD MPH
Harvard School of Public Health
665 Huntington Ave
Boston, MA 02115
Email:

HSPH Team Members:

Andrew Thorne-Lyman, ScD MHS, Email: ant268@mail.harvard.edu

Team Members in Nepal:

Dr. Prakash Sunder Shrestha, MD, Email: shresthaps@hotmail.com
Dr. Ram Chandyo, PhD, Email: ram.chandyo@cih.uib.no
Dr. Manjeswori Ulak MBBS, Email: manjeswori@gmail.com
Dr. Merina Shrestha, MBBS, MD, Email: drmerinashrestha@gmail.com

Team Members in Norway:

Tor Strand, Email: tor.strand@cih.uib.no
Sigrun Henjum, Email: sigrun.henjum@hioa.no
Ingrid Kvestad, Email: ingrid.kvestad@cih.uib.no

I) Executive Summary

Our planned, main research focus this year was to develop the capacity within Nepal which would allow us to undertake studies linking nutritional status to child development outcomes. The main project we had planned was to integrate the Ages and Stages Questionnaire (ASQ), an easy-to-use tool to assess the neurodevelopment of young children, into an ongoing study which was being conducted in Eastern Nepal by Heifer International and Tufts University, to test its suitability for administration under rural field conditions.

As the larger study was already underway, with a pre-planned visit to all child participants scheduled for May 2014, we aimed to administer the ASQ during that visit. Unfortunately, we experienced delays getting institutional review board (IRB) clearance for this work, so we were unable to integrate the administration of the tool into the

May data collection round. The next round of data collection from children is planned for November 2014 and we have scheduled a questionnaire training of enumerators in October. We have already translated the questionnaire into Nepali, received IRB clearance from both the Nepal Health Research Council (NHRC) and from Tufts University's IRB, and have been developing plans and protocols for the study and training.

In addition, we have begun work on a validation study of the ASQ against other child development tools including the Bailey-III and the Nepsy-II tools, an analysis that complements the work mentioned above.

We also completed and submitted/resubmitted four papers for peer-review journals from the baseline survey including two led by our Nepali colleagues. We continue to work closely with our colleagues in Nepal to develop capacity related to the analysis of nutrition-related data and the writing of manuscripts. Our Nepali colleagues also conducted a training of counseling on breast-feeding for medical professionals and Dr. Merina Shrestha is leading an additional study on child development in urban Kathmandu conducted as part of our Innovation Lab work.

II) Program Activities and Highlights

Since the start of our work through the Nutrition Innovation Lab, we have formed a core nucleus for collaboration composed of nutrition researchers from the Harvard School of Public Health, the Institute of Medicine at Tribhuvan University in Nepal, and the University of Bergen in Norway. Over the past two years, this collaboration broadened to include experts in child development from IOM Nepal and from University of Bergen as we recognized the need for greater capacity within Nepal to undertake studies linking agriculture, dietary intake, and child development during the first 1,000 days of life.

The main project we had planned for Year 4 of the collaboration was to explore whether the Ages and Stages Questionnaire-3 (ASQ-3), an easy-to-use tool to assess the neurodevelopment of young children, could be administered by trained enumerators working in the context of a remote rural household-level survey. If so, this would be proof of concept that it is feasible to include this questionnaire in rural fieldwork, adding another indicator to the toolbox used to explore outcomes associated with agriculture and nutritional interventions. Our proposal was to work with Heifer International and Tufts University, who already had a field-based study underway in Eastern Nepal, and offered to collaborate with us on this effort.

Unfortunately, our timeline for data collection proved to be overambitious. We had planned to include the ASQ-3 within a pre-scheduled round of data collection set for May 2014. However, we experienced delays receiving IRB clearance from the Nepal Health Research Council and the IRB at Tufts University, and therefore missed the window to administer the questionnaire. Since the beginning of the year, we have made

significant progress putting in place the plans and logistics to administer the survey during the next window of opportunity in November 2014. We have translated questionnaires into Nepali, received IRB clearances, and have made arrangements for the enumerators to receive training in Bhaktapur from us and from our colleagues from IOM.

We also have begun work on a validation study of the ASQ against other child development tools including the Bailey-III and the Nepsy-II tools. This work was also delayed due to the need to seek permission to use the data from other collaborators who had been involved in its collection. We now have garnered this permission and are proceeding with the analysis.

Dr. Merina Shrestha of IOM also designed and received IRB clearance to undertake a study of caregiver knowledge of child development within the Kathmandu Valley which she is leading. Dr. Shrestha will provide the first information within Nepal on this topic and which may also help contribute to our future work in rural settings.

As described below, we have also made significant progress in developing papers toward peer reviewed-publication, particularly those led by our Nepali colleagues. Our efforts on capacity building have been focused on helping our colleagues develop skills related to data analysis and paper writing. In addition, we helped to fund a training of 45 health practitioners on infant and young child feeding conducted at the IOM at Tribhuvan University Teaching Hospital from February 9 to February 28, 2014.

III) Lessons Learned

Our collaboration is comprised of researchers involved in multiple projects and while the collaboration is strong and possesses considerable goodwill, the multiple demands on the time of the researchers involved in the collaboration has challenged our ability move forward expeditiously with papers and analyses. In particular, we've realized that it is important to provide analytical support to our Nepali colleagues, many of whom have not received much in the way of advanced training in statistical analysis and rely predominantly on other projects for their salaries.

With this in mind, we are using unspent funds to hire a post-doctoral scholar who will be dedicated to supporting our research by working with our extensive dataset and supporting our research efforts. This position has been advertised and we are in the process of reviewing candidates. We anticipate that this addition will improve our ability to generate outputs. We will also be hiring a student at HSPH to help support these efforts.

IV) Presentations and Publications

Henjum S, Manger M, Skeie E, Ulak M, Thorne-Lyman AL, Chandyo R, Shrestha PS, Locks L, Ulvik R, Fawzi WW, Strand TA. (2014) Iron deficiency is uncommon among lactating women in urban Nepal despite high risk of inadequate iron intake. *British Journal of Nutrition*. DOI: [10.1017/S0007114514000592](https://doi.org/10.1017/S0007114514000592)

Thorne-Lyman AL, Spiegelman D, Fawzi WW. (2014) *Is the strength of association between indicators of dietary quality and the nutritional status of children being underestimated?* *Maternal & Child Nutrition*. Vol 10(1), pp. 159-160.

Dr. Ram Chandyo presented on “The changing dynamics of maternal nutrition in urban Nepal: findings from a longitudinal study in Bhaktapur” at the Experimental Biology conference in April 26-30, 2014 San Diego.

Publications in advanced stages draft/submitted (several other papers are underway):

Henjum S, Torheim LE, Thorne-Lyman AL, Chandyo RK, Fawzi WW, Shrestha PS, Strand TA. Low dietary diversity and micronutrient adequacy among lactating women in a peri-urban area of Nepal. *Paper submitted to Public Health Nutrition*.
Chandyo RK, Henjum S, Ulak M, Thorne-Lyman AL, Shrestha PS, Locks L, Ulvik RJ, Fawzi W, Strand TA. Anemia and iron deficiency are three-fold more common in breastfed infants than their mothers in Bhaktapur, Nepal. Paper about to be submitted to *European Journal of Clinical Nutrition*.

Thorne-Lyman AL, Fawzi WW, Henjum S, Chandyo RK, Locks L, Ulak M, Shrestha PS, Strand TA. Correcting for within-person measurement error in maternal dietary diversity score strengthens associations with maternal and child anthropometry and anemia in Bhaktapur, Nepal. Paper submitted to *Journal of Nutrition*.

Note: We may have another paper to add to this list by end of the month from Dr. Manju.