Feed the Future Innovation Lab
For *Collaborative Research on Nutrition* - Africa
Tufts University - Annual Report - Year 3

Feed the Future Innovation Lab

For Collaborative Research on Global Nutrition

Feed the Future Innovation Lab
For *Collaborative Research on Nutrition* - Africa

Annual Report
FY 2013 (Year 3)

Submitted by the Management Entity:
Friedman School of Nutrition Science and Policy
Tufts University
Boston

Feed the Future Innovation Lab

For Collaborative Research on Nutrition - Africa

Annual Report 2012/13 (FY 2013-Year 3)

Management Entity Information

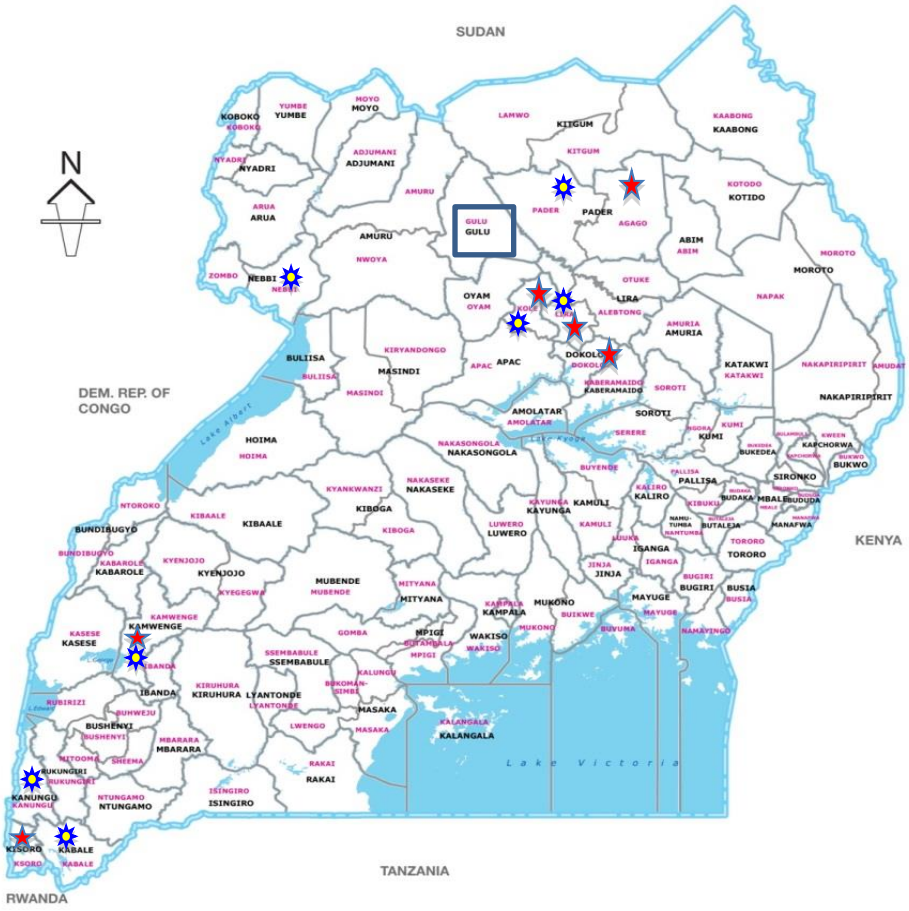
Tufts University's Friedman School of Nutrition Science and Policy is the Management Entity for the Feed the Future Innovation Lab for Collaborative Research on Nutrition – Africa (hereafter called the Nutrition Innovation Lab – Africa). Its activities are funded under grant contract AID-OAA-L-1-00006 from the United States Agency for International Development (USAID).

Core Management Team	Position	Email Address
Jeffrey K Griffiths	Program Director	Jeffrey.Griffiths@tufts.edu
Eileen Kennedy	Co-PD	Eileen.Kennedy@tufts.edu
Shibani Ghosh	Assoc. Director, Technical	Shibani.Ghosh@tufts.edu
Edgar Agaba	Local Coordinator, Uganda	Edgar.Agaba@tufts.edu
Liz Marino-Costello	Program Manager	Elizabeth.Marino-Costello @tufts.edu

Global Technical Advisory Committee Information

Technical Advisory Committee	Position	Institution	Email Address
Shakuntala Thilsted	External advisor	Senior Nutrition Advisor, WorldFish Center, Bangladesh	sht@life.ku.dk
Richard Deckelbaum	External advisor	Director, Institute for Human Nutrition, Columbia University	rjd20@columbia.edu
Victoria Quinn	External advisor	Senior Vice President, Helen Keller International	vquinn@hki.org
Ram Shrestha	External advisor	Founder and Director, Nepalese Technical Advisory Group (NTAG)	ramntag@gmail.com
Shelley Sundberg	External advisor	Senior Program Officer, Bill and Melinda Gates Foundation	Shelley.Sundberg@gatesfoundation.org
Mary Bassett	External advisor	Doris Duke Foundation	mbassett@ddcf.org
Steven Vosti	External advisor	Faculty, University of California, Davis	svosti@ucd.edu
Barbara Seligman	Core partner representative	Technical Area Manager, Health, Development Alternatives, Inc.	Barbara_Seligman@dai.com
Maura Mack	AO Technical advisor	USAID BFS	mmack@usaid.gov
Ahmed Kablan	Nutrition advisor	USAID	akablan@usaid.gov

Map indicating Uganda study sites



Baseline with repeat panel surveys

Longitudinal Birth cohort sites and Process research

Gulu Birth cohort study

Research Activities:

1. Repeated Panel Survey Sites (Baseline Survey, Year 3): North: Agago, Dokolo, Kole, Lira, Southwest: Kisolo, Kamwenge. Agriculture, Nutrition, Health surveys conducted in collaboration with Makerere University, Harvard School of Public Health, Tufts University, IFPRI
2. Longitudinal Birth Cohort Sites: North: Pader, Nebbi, Lira, Kole, Southwest: Kanungu, Kabale, Kamwenge in collaboration with Makerere University, Harvard School of Public Health, Tufts University, IFPRI
3. Supported Birth Cohort Doctoral Research Site in Gulu in collaboration with Gulu University, Tufts University, Cornell University (via doctoral student support)
4. Process Research Sites: Kampala (national level analyses), Pader, Nebbi, Lira, Kole, Kanungu, Kabale and Kamwenge

Table of Contents

List of Program Partners

US Partners

- Harvard University
- Purdue University
- Tuskegee University
- Johns Hopkins University
- Boston University (informal partner)
- University of Illinois (water; informal partner)
- Virginia Tech University (microbiome analyses; informal partner)
- University of Georgia (aflatoxin assays; contractual partner)
- Development Alternatives, Inc. (DAI)
- International Food Policy Research Institute (IFPRI)
- National Aeronautical and Space Agency (NASA)

Uganda-based Partners

- Makerere University: School of Agriculture and Nutrition Sciences
- Makerere University: School of Public Health
- Gulu University
- FHI360 (Uganda Community Connector Project)
- Government of Uganda districts and ministries
- National Agriculture Research Centre
- Heifer Uganda (for conduct of studies in Uganda to mirror studies in Nepal)

Malawi Based partners

- Bunda College, Lilongwe University of Agriculture and Natural Resources (LUANAR)
- University of Malawi, College of Medicine, Malawi
- Department of Nutrition, HIV and AIDS, Office of the President, Malawi
- Ministry of Health, Malawi

Other international partners

- LCIRAH (Leverhulme Centre for Integrated Research on Agriculture and Health - University of London)
- UNICEF (sharing of resources and knowledge in Uganda and Malawi)
- Food and Agriculture Organization (FAO) – technical support in Malawi
- Heifer International
- AusAID (for Timor Leste study of aflatoxins)
- University of Jakarta (for Timor Leste study of aflatoxins)
- University of Georgia (for Ghana Peanut Value chain and Timor Leste study)
- St Johns Medical College, Bangalore, India (BBNC)

Acronyms

ACBT - Aquagenx Compartment Bag Test
AusAID- Australian Agency for International Development
BBNC - Bangalore-Boston Nutrition Collaborative
BIFAD - Bureau for International Food, Agriculture and Development
DAI - Development Alternatives Inc.
DHS - Demographic and Health Survey
ECD - Early Childhood Development
GAIN - Global Alliance for Improved Nutrition
GU - Gulu University
HSPH - Harvard School of Public Health
HI - Heifer International
HKI - Helen Keller International
IITA - International Institute of Tropical Agriculture
IFPRI - International Food Policy Research Institute
LCIRAH- Leverhulme Centre for Integrated Research on Agriculture and Health (University College London)
Makerere - Makerere University
NGO - Non-governmental agency
NASA - National Aeronautical and Space Agency
UCCP - Uganda Community Connector Project
UNICEF -United Nations Organization for Children
UN/SCN-United Nations Standing Committee on Nutrition
UGA - University of Georgia, Athena
UIC- University of Illinois, Chicago National Science Foundation Water Research Center

I) Executive Summary

The Nutrition Innovation Lab Africa seeks to discover how agricultural and nutrition policy and program initiatives can cost-effectively achieve large-scale benefits in maternal and child nutrition. Using host country and US institutional resources, our research and capacity building focuses on operationally relevant work that supports national government priorities while using innovative approaches, latest thinking, and cutting-edge technologies. In FY 2013, the Nutrition Innovation Lab's Africa-focused activities significantly expanded. New relationships were forged with partners such as such as SPRING, NASA, Heifer International (HI), UIC, IITA, UGA, and FHI360. The core research revolves around the USAID Uganda Community Connector project (UCCP), an integrated agriculture and nutrition intervention package implemented by FHI360. Our effectiveness research includes comprehensive repeated panel surveys assessing agriculture, nutrition, and health pathways and providing evaluation data to UCCP; a prospective birth cohort study to dis-entangle the nutrition or health gains of key target groups, e.g. pregnant women and infants; and process research to examine the implementation of multisectoral actions for good nutrition. The birth cohort study is a 'platform' which can be used to assess top-rank hypotheses – e.g. linking water and sanitation (WASH) and mycotoxins (aflatoxin) to nutrition – while answering key questions on how and why integrated interventions may succeed.

In FY2013 primary data collection, baseline in-depth surveys from 3,630 households were completed in six UCCP Phase 1 and Phase 2 districts within 4 months of the UCCP finalizing its intervention districts. Baseline findings were compiled into a report presented to USAID Uganda and to FHI 360. A series of dissemination seminars were held at the national and district level. Data collection was completed in a complementary Lab funded birth cohort study of 400 mothers located in Gulu. This study (a Ugandan doctoral student project) assesses food insecurity, maternal depression, and HIV infection. Gulu cohort samples will also be used to assess alfatoxin exposure and early childhood development. The Nutrition Innovation Lab with UIC pilot validated an innovative water quality assessment test, the Aquagenx compartment bag test (ACBT). Use of the ACBT will allow the Lab and UCCP to assess WASH behavior change activities. An analysis (using baseline panel data) examined the relationship of household food insecurity, and anemia in women with fruit and vegetable production. Another secondary analysis utilizing a NASA dataset examined agricultural land use, biomass fuel and health. It examined the role of cooking fuels from agricultural land and forests in causing respiratory illness, which are linked to poor nutrition. Modeling the links of agriculture productivity to nutrition through the interaction of seasonality and climate variability with agricultural output and nutrition and how geography (agro-ecology, altitude, remoteness from markets) affects household outcomes is underway.

The Nutrition Innovation Lab advocated for the need to examine the role of aflatoxin exposure in maternal and infant nutrition, which is likely to lead to Associate Awards to fund further analyses in the Ugandan studies. The Nutrition Innovation Lab Africa in collaboration with the Nutrition Innovation Lab Asia facilitated a study of aflatoxin exposure and nutrition in Timor Leste partnering with the University of Jakarta (Indonesia), UNICEF in Timor Leste and the University of Georgia aflatoxin research laboratories (linked to the Peanut and Mycotoxin Innovation Lab). Support was provided through peer review on the Livestock and Climate Change Innovation Lab RFA to characterize the microbiome shared by livestock and children in Nepal. The Innovation Lab held fruitful and constructive meetings with the Missions in Ethiopia, Egypt, Rwanda, Ghana and the Regional Mission for West Africa and East Africa.

II) Program Activities and Highlights

The Nutrition Innovation Lab's research in Uganda went to scale during 2012/2013. Below is a summary of key activities and highlights of the Nutrition Innovation Lab Africa activities

- A first full round of data collection was completed for the baseline panel with preliminary analysis completed. In September 2012 the UCCP identified its implementation districts following which the Nutrition Innovation Lab-Africa surveyed 3,630 households in 6 UCCP (Phase 1 and 2) districts. This activity was accomplished by December 2012.
- The baseline panel survey is the most comprehensive assessment to examine linkages/pathways for agriculture, nutrition and health ever conducted at this scale in Uganda. Data were also collected on primary caregivers and children under 5 for anemia and malaria. The team was composed of Makerere, HSPH, IFPRI and Tufts.
- Initial descriptive results were presented to USAID/Uganda and the UCCP in March-April 2013, discussed at a public Kampala workshop in June 2013, provided to district governments in August 2013, and outlined at the International Nutrition Congress in Grenada, Spain in September 2013. Details of these dissemination presentations are provided in Appendix 1.
- Initial findings highlighted the role of dietary animal-source protein in reducing stunting, fruits and vegetable intake decreasing anemia, and the effects of malaria on anemia. This survey is a baseline for assessing the UCCP, and will help empirically populate pathways linking agriculture, nutrition and health in two different agro-ecological setting in Uganda. These sites will be revisited to provide longitudinal panel data to complement our longitudinal birth cohort data.
- Extensive planning has been underway for the birth cohort study. The Core Birth Cohort Study (to start in FY 2014) will provide prospective data on the value of UCCP interventions in key target groups, pregnant women and infants. It will also serve as a platform for evaluating factors such as water and sanitation, as well as the effects of aflatoxin exposure on growth outcomes.
- Planning for national and local process and implementation qualitative research proceeded. Studies are scheduled to commence in January 2014 (national level) and summer 2014 for the district level analyses.
- Collaboration and interaction in the effort of linking agriculture to nutrition with other Innovation Labs (Livestock and Climate Change, Peanut and Mycotoxin) as well as with non Innovation Lab partners including CGIAR centers such as IITA (Africa Rising) as well as international NGOS and initiatives such as SPRING (Nutrition GLEEs and subsequent interactions) and the Global Alliance for Improved Nutrition
- Capacity Building: Nineteen longer-term students were supported from Uganda and from Malawi through student funding to: attend national universities; conduct field research; or to attend Tufts, Purdue, Harvard, or Tuskegee University. Six attended a nutrition research course at St. John's Research Institute, in Bangalaore, India, and 123 others received short-term training. In addition, nutrition-related academic curricula are being revised in Uganda and Malawi.
- Active interaction with Missions in Rwanda, Egypt and Malawi. Malawi Associate award activities are progressing.

In addition to these efforts:

- The Nutrition Innovation Lab-Africa supports a birth cohort (n=400 women enrolled in a prenatal clinic) conducted by a Gulu University faculty member, Barnabas Natamba, who is also a PhD student at Cornell University. This study examines issues of food insecurity, HIV infection, and depression – all of which may influence maternal and child nutrition and health. Data from this study will be used to help the Nutrition Innovation Lab Africa with fine tuning issues such as the timing of aflatoxin assays, ECD, logistical support and cold chains in the core birth cohort study.
- WASH (Water, Sanitation and Hygiene) has received renewed attention for nutrition and health. Pilot testing in June 2013 of the Aquagenx compartment bag test (ACBT) in Lira District (with partners Makerere, UIC) showed that the ACBT effectively detects water source and household water contamination. (The ACBT was later identified and highlighted by USAID as a true innovation for assessing water quality). The Nutrition Innovation Lab – Asia has also adopted the ACBT for studies in Nepal.
- Analysis of Ugandan DHS and National Household Survey data was integrated with remote sensing (satellite) data provided by NASA to examine spatial and temporal patterns in agriculture and health. The study provided novel insights into direct pathways linking agricultural practices, biomass fuel for cooking, and human health. This validated approach will be used in the ongoing primary data collection studies to identify appropriate points of policy intervention, the magnitude of nutritional impacts resulting from policy-driven socio-behavioral changes in households and communities, and investigate higher level factors such as economic forces, market conditions and pricing, health infrastructure, and climate and weather which influence nutritional outcomes.

III) Key Accomplishments

Theme A (Scientific Research) The three scientific research targets were **exceeded** (Table 1) in FY 2013. The Nutrition Innovation Lab Africa exceeded the target number of **26** with **28** institutions, which gained *enhanced capacity in nutrition research, monitoring and surveillance methodologies, nutrition information systems, and/or nutrition interventions with USG assistance*. Four Ugandan universities (Makerere, Kyambogo, Mukono, Gulu), 3 line Ministries (Health; Agriculture; Gender, Labor, and Social Development) as well as the Office of the Prime Minister, 7 districts (Dokolo, Kanungu, Kirihura, Agago, Pader, Kamwenge, Kisoro), FANTA and the Regional Centre for Quality Health Care as well as IFPRI, SPRING, IITA, IHSU, MIRS, VEDCO, PDLG, IPA, BRAC, fhi360, MAIIF, and Grameen Foundation participated in capacity building activities. In Malawi, our partner Bunda College of Agriculture transitioned to become Lilongwe University of Agriculture and Natural Resources (LUANAR). These are in addition to the Nutrition Innovation Lab core universities (Tufts, Harvard, Purdue, Johns Hopkins, Tuskegee).

The *number of food consumption and/or nutrition surveys undertaken or reported on* during FY13 totaled **19**, rather than the 11 anticipated. The panel survey of 3,630 households was counted as one survey, although it represents efforts in 6 districts. The total of 19 rather than 11 was substantially due to the support provided to Masters students at Makerere on undertaking and reporting on surveys publicly in the Kampala June 2013 symposium. This also includes the Gulu birth cohort nutrition study. Team members at Purdue completed nutrition surveys in western Uganda related to climate change and respiratory health modeling, and DAI reported on a value chain study it had completed in FY12. The related metric of *number of institutions or individuals having completed a nutrition assessment, survey or gap analysis* was **14** rather than the target of **12.** Three gap analyses in Malawi for the dietetics program at LUANAR, enhanced School of Medicine and Nursing medical worker preclinical education, and for Malawian food composition tables were substantially but not fully completed and will be reported out as completed in the coming year (FY14).

Theme B: Human and Institutional Capacity Building: All targets but 1 were **exceeded** (Table 1). Longer-term training in child health and nutrition was provided to **19** rather than the target of **2** persons. This is substantially due to master's student support in Uganda. Short-term training was provided to **129** (rather than the target of **100**) persons. Of the 148 persons benefitting from long term or short-term support, 84 were males and 64 were females. **Fifteen** institutions gained enhanced capacity to assess, plan, design, implement, monitor or evaluate nutrition programs, policies and practices, rather than the target of **12**. We fell short of our target of **7** submitted or published manuscripts co-authored with host country institutions and others in country, but exceeded the target of **20** briefs and presentations with a total of **21.** As outlined in subsequent sections, dissemination of research findings was accomplished at meetings in Uganda, Tanzania, Ghana, numerous sites in the US, and in Europe; on-line; and in global webinars, and the Nutrition GLEEs via recorded seminars.

The Nutrition Innovation Lab-Africa commitment to capacity building (improving host country academic, technical and research capacity in nutrition health and agriculture) was further strengthened through formal Board adoption of selection criteria for candidates seeking training support.

Table 1: Nutrition Innovation Lab Africa Targets and Achievements (FY 2013)

Theme (a): Scientific Research				
Outcomes	**Indicator Number**	**Output Indicators**	**FY 2013 Targets**	**FY 2013 Actuals**
Outcome 1: Improved host country nutrition and food security monitoring, analytics and surveillance capacities	N/CRSP	1. Number of U.S. and host country institutions that have gained enhanced capacity in nutrition research, monitoring and surveillance methodologies, nutrition information systems, and/or nutrition interventions with USG assistance	26	28
	N/CRSP	2. Number of food consumption and/or nutrition surveys undertaken, or reported on and disseminated	11	19
	N/CRSP	3. Number of U.S. or host country institutions or individuals having completed a nutrition assessment, survey or gap analysis.	12	14
Theme (b): Human and Institutional Capacity Development				
Outcomes	**Indicator Number**	**Output Indicators**	**FY 2013 Targets**	**FY 2013 Actuals**
Outcome 2: Improved host country academic, technical and research capacity in nutrition, health and agriculture	N/CRSP	4. Number of people trained in child health and nutrition (nutrition science, dietetics, public health nutrition) through USG supported programs (longer term)	2	19 (11M, 8F)
	N/CRSP	5. Number of people trained in child health and nutrition (nutrition science, dietetics, public health nutrition) through USG supported programs (short term)	100	129 (73M, 56F)
	N/CRSP	6. Number of US and host country institutions with enhanced capacity to assess, plan, design, implement, monitor and/or evaluate nutrition programs, policies and practices	12	15
	N/CRSP	7. Number of U.S. and host country institutions and individuals who have gained enhanced capacity in clinical, operational, agricultural, translational and/or public health nutrition research aimed at the reduction of malnutrition with USG assistance	100.	163 84M, 64F, 15 inst
	N/CRSP	8. Number of peer-reviewed journal articles co-authored with host country institutions and others in country with USG assistance (submitted or published)	7	3
	N/CRSP	9. Number of brief articles and presentations co-authored with host country institutions and others in country with USG assistance	20	21

IV) Research Program Overview and Structure

The Feed the Future Innovation Lab for Collaborative Research on Nutrition - Africa focuses research on food and nutrition in developing countries in line with recommendations from a 2012 BIFAD external review of funding modalities for US university research.[1] That report notes that the exceptional capacity of the US research community is best leveraged to achieve international development goals when working in a "collaborative, interdisciplinary and development-focused" manner with national institutions on research questions that resonate both at global and local levels (BIFAD 2012, p.9). That perfectly describes the modus operandi of the Nutrition Innovation Labs, including:

- A 'deep-dive' focus of research in *Feed the Future* priority countries,
- An applied focus (operations or 'delivery science' research rather than bench science),
- A focus on country-ownership (supporting research that includes national stakeholders and informs locally-defined priorities in food and nutrition),
- Resources are allocated to few grants at larger scale, rather than many small grants supporting studies of experimental or pilot activities,
- Institutional and human capacities for analysis and policy formulation developed through a mix of formal education (degree programs), short-term training activities, workshops and engagement of local partners in national scientific symposia.

Following these principles, the Nutrition Innovation Labs focus on over-arching research questions: namely, 1) How can investments in agriculture achieve significant measurable impacts in nutrition (can pathways to impact be empirically demonstrated)? 2) How can large-scale programs best incorporate such knowledge into cost-effective multi-sectoral interventions aimed at improving nutrition? And 3) How can policy and program implementation processes be enhanced to support both nutrition-specific and nutrition-sensitive actions?

These overarching questions frame a series of nested studies that seek to generate empirical evidence responding to developing country policymaker concerns, while supporting the goals of the Feed the Future initiative. There is still very limited empirical evidence to support the assumption that higher productivity and diversity of agricultural outputs supports enhanced maternal and child nutrition outcomes. Therefore, the Innovation Lab undertakes applied research to determine the effectiveness of various approaches to linking agriculture and nutrition in diverse agro-ecological contexts. The research is pursued in ways that seek to enhance policymaker understanding of how to overcome constraints in policy and program design and implementation, while also producing global public goods in the form of new scientific knowledge of relevant and diverse settings.

Tufts University's Friedman School of Nutrition Science and Policy serves as the Management Entity for the Nutrition Innovation Lab for Africa (as well as that for Asia, which allows for intellectual synergies and cost-savings to both programs). The Friedman School implements the program of work in partnership with several US university partners – Tuskegee, Purdue, Johns Hopkins, and Harvard – as

[1] BIFAD (2012). *BIFAD Review of the Collaborative Research Support Program (CRSP) Model*. A Report Commissioned By BIFAD at the Request of USAID. August 2012. Washington, D.C., Mimeo.

well as Development Alternatives, Inc. The core team manages resources in a manner that allow for the generation of i) empirical evidence of what works in leveraging agriculture for improved nutrition through multi-sector programming, and ii) enhanced institutional and human capacity in Africa to conduct research and implement integrated Nutrition activities in future years.

Additional US and European universities (University of Illinois, Chicago, Virginia Tech, University of Georgia; University College London) have also become partners in FY 2013 as new initiatives have emerged. In all cases, close collaboration is ensured with USAID Uganda, host country partners, including Makerere University, Ugandan line Ministries (particularly Health, Agriculture, and Gender, Labor, and Social Development), district administrations and government service providers. Having supported the efforts of the Uganda Nutrition Working Group (leading up to adoption of the Uganda Nutrition Action Plan) the Nutrition Innovation Lab Africa has continued to interact with governmental planners in the Office of the Prime Minister, which coordinates the national nutrition agenda. In Malawi, the Innovation Lab interacts with the Department of Nutrition, HIV and AIDS (DNHA) under the Office of the President and Cabinet (OPC), the Ministry of Health, and institutions such as Lilongwe University of Agriculture and Natural Resources (LUANAR; formerly Bunda Agricultural College).

In Uganda, the main research activities are implemented by Makerere, Harvard and Tufts University faculty and staff. This team is aided by an IFPRI staff member and a Nutrition Innovation Lab – Africa coordinator. Complementary research is conducted by other partners (such as Gulu and Purdue universities, NASA). The list of awards are provided in Appendix 2. In FY2013 the Makerere Principal Investigator, Her Excellency Prof. Joyce Kikafunda, transitioned to a new position as High Commissioner to the United Kingdom for the Republic of Uganda, and Prof. Bernard Bashaasha took over the lead role. In Malawi our activities fall solely under Theme B (capacity building).

A consolidated research protocol was prepared in 2013 for activities in Asia to explain how the elements are conceptually linked.[2] Some aspects of the research from this protocol are similar to Africa, and some are different, but essentially they adhere to the same key objectives.

V) Research Project Reports

V.1.1 Core Baseline Panel Survey. **The goal is to empirically understand pathways by which interventions in agriculture impact on nutrition, and how such pathways can be enhanced through appropriately designed multisector interventions**.

Uganda has significant and geographically varied challenges in nutrition and health. About 377,000 children under five are wasted (weight for height Z score < -2), with wasting rates exceeding emergency thresholds of 15% in the Northern regions; an estimated 2.34 million pre-school children (34%) are stunted (height for age Z score < -2), and 87% children under 2 are anemic. Fourteen percent of infants are born with low birth weight (< 2.5 kg). With respect to women, 64% of all pregnant women are anemic and 12% of adult women are classified as underweight (body mass index < 18.5 kg/m2) reaching

[2] Webb P, Ghosh S, Kennedy E, West K, Klemm R, Sapkota D, Manohar S, and Griffiths J. 2013, *Research in Asia: Approach, Methods and Protocols*. Feed the Future Innovation Lab for Collaborative Research on Nutrition. Tufts University, Boston (last updated November 5th, 2013) – at http://www.nutritioninnovationlab.org/asia/research/

to 23% of women in the poorest wealth quintile[3]. Rates of under five mortality remain high (69 per 1000 live births in 2012) while maternal mortality is 310 per 10,0000 (2010 data) is much higher than the MDG 2015 target of 131. About 15% and 19% of post-natal under five deaths are caused by diarrhea and pneumonia, conditions that are strongly linked to nutritional deficiencies. Furthermore while there is strong commitment towards improving agriculture in Uganda, with aid rising from under 3% in 2002 to over 5% in 2006, reflecting donor and governmental commitment to the promotion of agriculture.[4] As noted in the Uganda CAADP Compact to Support the Successful Implementation of the Agricultural Sector Development Strategy and Investment Plan (DSIP) "The Government of Uganda is committed to supporting agricultural development in order to achieve sector growth, raise farm incomes, reduce poverty and ensure food and nutrition security."[5] Unfortunately, growth in agriculture has both fallen and risen (7.9% in 2000, falling to 0.1% in 2006/2007, then rising again to ~4.7% in 2010). Thus significant efforts are needed to reach the Comprehensive Africa Agriculture Development Programme (CAADP) agricultural growth threshold of 6%.[6]

The potential impact of appropriate interventions is illustrated by a 2006 World Bank analysis showing that crop yields in Uganda can be tripled and in some cases increased 10-fold. A single 'solution' to Uganda's complex nutrition, health, and agricultural problems is impossible, but an overarching strategy is essential. Jacob Lew (Deputy Secretary for Management & Resources, US Department of State) noted that *Feed the Future* seeks to take the links from productivity and rural income growth to "improve[d] household nutrition."[7] But how can cost-effective interventions in any one sector that result in sustained behavioral changes supportive of nutrition, be 'matched' with interventions and behavior changes in other sectors? How can stakeholder buy-in and delivery efficiencies be enhanced? To address these questions in the literature, the Nutrition Innovation Laboratory-Africa (formerly called the Nutrition Collaborative Research Support Program) is working closely with the USAID Uganda Community Connector Project in understanding linkages, associations and relationships between agriculture, nutrition and health and the effectiveness of interventions addressing needs within these domains.

In support of the USAID Uganda Community Connector and its research objectives, the Nutrition Innovation Laboratory-Africa conducted a baseline panel survey in six districts implementing the Community Connector (CC) Project. The baseline survey was conducted in the six rural districts of Kisoro and Kamwenge in Southwestern Uganda and Dokolo, Kole, Agago and Lira in Northern and North Western Uganda between September and December 2012. The survey focused on the household, the mother of the household (and/or primary care giver), one index child aged 6-23 months and all other children between the ages of 0 and 59 months. A total of 3630 households were surveyed. A total of 4500 children under five, including 1870 children 0-24 months and 3450 women (mothers/primary caregivers) were measured/interviewed. Data were collected on socio-economic and demographic

[3] UNICEF, 2009. *Tracking Progress on Child and Maternal Nutrition*. New York.
[4] S Fan, T Mogues and S Benin, 2009. Setting Priorities for Agricultural and Rural Development in Africa. IFPRI Policy Brief 12. Washington: IFPRI.
[5] Government of Uganda, 2010. Uganda CAADP Compact to Support the Successful Implementation of the Agricultural Sector Development Strategy and Investment Plan (DSIP). Kampala, March 31 2010.
[6] S Fan, T Mogues and S Benin, 2009. Setting priorities for Agricultural and Rural Development in Africa. IFPRI Policy Brief 12.
[7] J Lew, 2010. *Promoting Global Food Security: Next Steps for Congress and the Administration*. Testimony before the Senate Foreign Relations Committee, Washington, D.C., April 22, 2010.

characteristics, agricultural production characteristics, income sources, use of agricultural technologies and sources of agricultural information, gender, decision making and time allocation, health and morbidity of the index children, diets of the mothers and children and heights and weights in all children. In index children, and their mothers/primary caregivers, levels of hemoglobin and presence of falciparum and other forms of malaria was assessed.

Nutritional status in children and women varies by district and location in Uganda. Stunting rates are highest in southwest Uganda while wasting rates are higher in the North of Uganda. Anemia prevalence in children was high except in Kisoro, which is largely malaria free. Further data examination indicates a strong relationship between serum hemoglobin and malaria indicating that the anemia in children is not only nutritional in nature. (Future surveys will use more specific indicators of iron status to examine the relationship of anemia to dietary iron). Stunted children were less likely to consume animal source foods and were more likely to belong to households that were food insecure. More households in Kole are food secure than in any other district while Lira had the lowest percentage of households reporting food security over a year. Food security 'in the past month' was worst in Agago and Kisoro.

Most households interviewed were dependent on agriculture as a main source of income. Many Agogo district households were also reliant on 'off farm' income. Market orientation was low with most households reliant on the local sale of crop products and few households marketed livestock products. Use of improved agricultural technologies and improved seeds was very low except in Dokolo district. The source of agricultural information in most districts was the radio followed by some information transferred through the agricultural extension agent. There are evident relationships between agriculture and nutrition. Less stunting was seen in infants from households with cash crop production or households with livestock. Livestock ownership benefitted poor households more than richer households in terms of child stunting. There was a strong relationship between poverty and the nutritional status of household mothers/primary caregivers. All of these results have been provided to USAID/Uganda and to the UCCP.

More in-depth analyses are underway to understand the nature of these, and other, relationships. (Please see section V.1.7 for example). Future sequential panel surveys in the same households will allow the Nutrition Innovation Laboratory-Africa to assess the work of the UCCP, and to determine changes in key parameters of health, agriculture and nutrition and their relationships. We will adaptively incorporate, and more deeply investigate, novel insights from these analyses and the next round of these surveys and into our cohort study (V.1.2, below).

V.1.2 Core Birth Cohort Study.

The goal is to generate prospective, highly rigorous evidence that help better understand the agriculture to nutrition linkages relative to the role of maternal status in child growth and development as well as examine the effectiveness of large scale integrated/multi-sectoral programming targeting maternal and child nutrition.

Infant and young child nutrition is in part mediated by the breadth and adequacy of the diet (including breastfeeding), maternal health and nutrition through pregnancy, and by factors which affect intestinal

function and inflammation. The latter include factors that can be altered by the provision of safe water, sanitation and hygiene (WASH) and by environmental toxins such as mycotoxins. The relative importance and inter-relatedness of these factors in causing maternal and infant and child undernutrition is unknown. Exclusive breastfeeding, maternal nutritional status through pregnancy, pregnancy and birth outcomes (such as birth weight), household hygienic practices and knowledge, parental education, gender associated income activities, and other known salient elements may operate through several causal pathways to alter these – and potentially other - major mediating influences.

To address the complex nature of infant and young child nutrition, the Nutrition Innovation Laboratory Africa team is planning an observational birth cohort study in districts where USAID's UCCP is active, and in districts where the UCCP is not active. The birth cohort study is targeted to intensively study pregnant women, the children they bear, and their households. Because pregnant women and young children are very sensitive to inputs which change nutrition and health, they are an ideal target group for studying the impact of agriculture, nutrition, and health interventions. Outcomes can be assessed at the household and individual level, and process indicators such as UCCP program fidelity and delivery can be studied at the household, sub-parish, and district levels. Prospective birth cohorts are a 'gold standard' study approach, which allows comparisons across national boundaries as well as within a country. The prospective nature of a birth cohort also helps to address the issues of causality. This serves the Nutrition Innovation Laboratory's research agenda, and the USAID goal of developing a global, evidence-based approach for allocating its resources.

This quasi-experimental study will utilize a cohort of mothers and young children followed from pregnancy through the first two years of life to evaluate the effectiveness of UCCP to improve household livelihoods and maternal and child nutrition and health in rural northern and southwestern Uganda (n=5152 pregnant women). The cohort will be established in randomly selected UCCP Phase I and Phase II subcounties and in matched non-UCCP subcounties that will provide a counterfactual to evaluate the UCCP and its interventions. Each selected UCCP subcounty will be individually matched to a non-UCCP subcounty with the same agroecology and predominant language. The matched subcounties will be in non-CC districts to minimize spillover from intervention areas.

The enrollment period will be 12 months, to capture one year of seasonal effects on nutritional status, health, and other processes, practices, and outcomes. In populated subcounties that are expected to have more than the targeted number of live births during the enrollment period, based on population projections from the Uganda Bureau of Statistics (UBOS), a subset of parishes will be randomly selected to participate in this study. In all study areas, a pregnancy surveillance system will be established to identify pregnant women, who will be recruited for the study. Participating pregnant women, their households, and later their infants will be visited periodically through pregnancy, delivery, and until their children turn two years of age. They will be assessed for nutritional status based on anthropometry and selected biomarkers, perinatal outcomes, health status and health environment, diet and food security, household income, agricultural and other livelihood activities, and program exposure at the household and individual level.

In FY2013 / Year 3, cohort activities focused on study design, site selection, protocol development for human ethics approval, the identification of logistical issues and their solutions (including cold chains), human resource needs, preparatory discussions with known and potential partners, instrument

construction, and data management issues. While relatively invisible outside of the Lab these have been critical engagements for the successful launch of the cohort study in FY2014.

V.1.3 Uganda Policy Process Research.

The goal is to empirically determine how approaches to collaboration and the 'quality' of policy implementation (determined through the knowledge, attitudes and practices of stakeholders involved in implementing multisector policies and actions), may impact agriculture, health and nutrition outcomes on the ground.

Much effort has been dedicated to conceptualizing pathways from agriculture to nutrition. This has not been matched by rigorous pathway validation. Research in many countries currently focuses on design issues relating to complex multisector programming. However, much less attention has been paid to the role of policy implementation across ministries and sectors, and the potential for assessing fidelity of governance as a contributor to program outcomes. We address this issue.

This aspect of our research involves collecting unique primary data derived from interviews with policymakers at all levels of governance in Uganda. In FY2013 we identified key informants in Uganda. National level stakeholder interviews will be conducted in January 2014 by Prof. Eileen Kennedy. District and lower level interviews will occur at the same time as the second panel survey (September – December 2014) as well as during the birth cohort study implementation. This approach will provide comparability and contrasts to similar research being conducted in Nepal. (Planned implementation in FY2013 was deferred to FY2014 after USAID/Uganda input). Implementation in FY2014 will allow us to take advantage of operational insights and outcomes gained by implementation in Nepal during FY2013 and to synchronize the district and local level collection with the activities related to our panel and cohort studies.

Using mixed methods, the Uganda process research will conduct structured and semi-structured surveys with policymakers and other stakeholders across eight sectors of activity relevant to the implementation of the Uganda multi-sector nutrition plan and the Uganda Scaling of Nutrition movement: namely, agriculture (cropping and livestock separately), health, nutrition, water supply, sanitation, local development, other social welfare. Government officials in each of these line ministerial functions will be identified at defined 'layers' of governance and interviewed in relation to their responsibility for the flow of decisions and resources relevant to actions on the ground in the same sites in which community-level data will be collected in the second panel and the core birth cohort study. Additional non-governmental stakeholders working on agriculture and nutrition programming were also interviewed at each layer and location.

V.1.4 Gulu Birth Cohort Study:

The goal is to examine issues of food insecurity, HIV infection, and depression – all of which may influence maternal and child nutrition and health.

The Nutrition Innovation Lab-Africa supports a birth cohort (n=400 women enrolled in a prenatal clinic) conducted by a Gulu University faculty member, Barnabas Natamba, who is also a PhD student at Cornell University. We support his doctoral research in Uganda. Gestational weight gain, one of the study outcomes, is also a critical determinant of infant nutrition and health. There are ~ 5,000 observations in the mothers. After delivery of the infants of the 400 women, 250 of these women and 250 of their infants were enrolled in a second phase study which has now begun. This second phase will include neurocognitive early childhood development (ECD) assessments at 6 and 12 months of age. In August 2013, USAID/East Africa expressed interest in funding (via an Associate Award) a study of the relationship between aflatoxin exposure, maternal weight gain, birth weight, and infant growth using prospectively collected samples from this cohort. Data from this study will be used to help the Nutrition Innovation Lab - Africa to refine its approaches to aflatoxins, EDC, logistical support and cold chains in the larger core birth cohort study (V.1.2). Mr. Natamba has submitted several manuscripts for publication based upon the validation of tools used to evaluate the Gulu birth cohort. These include the development and validation of an *individual* food insecurity access scale to parallel the household food insecurity access scale currently in wide use (see section V.1.7 for use of the latter by our team).

V.1.5 Water Quality Validation Studies:

The goal is to understand the role of water and sanitation in the pathways linking agriculture, nutrition and health. The goal of this pilot study was to validate the use of a field friendly water quality kit called the Aquagenx compartment bag test (ACBT).

WASH (Water, Sanitation and Hygiene) has received renewed attention for nutrition and health. Pilot testing in June 2013 of the Aquagenx compartment bag test (ACBT) in Lira District (with partners Makerere, UIC) showed that the ACBT effectively detects water source and household water contamination. (The ACBT was later identified by USAID as a true innovation for assessing water quality. As part of the evaluation, samples were tested using the ACBT and the 3M Petrifilm *E.coli*/Coliform Count Plates. Both tests use *E. coli* as an indicator of fecal contamination in the water samples. The samples for both tests were examined after 24, 48 and 36 hours. In 14 out of the total 25 samples both tests detected the presence of *E. coli.* In the remaining samples (11 out of 25) *E. coli* was not present in the 3M Petrifilm plates but it was detected with greater sensitivity by the Aquagenx test, confirming its appropriateness for our purposes. In addition to the validation testing, the pilot study found (1) that only borehole water was free of contamination, and (2) that household water contamination was statistically linked to the presence of stunting in household children. Testing of both source and household water indicated that significant fecal contamination occurs in the household, providing evidence for interventions aimed at reducing household contamination. These insights will be further explored in the baseline panel (and repeat panels) as well as the birth cohort study. The use of the ACBT will add precision to our assessments of household hygiene status and provide a biologically relevant marker over time for our panel and cohort studies (V.1.1. and V.1.2). Furthermore, they will add a point of comparability between the work in Uganda and the studies in Nepal.

V.1.6 Climate and Integrated Agro-Ecological Modeling:

The goal is to examine spatial and temporal patterns in agriculture and health.

The analysis including harvesting data from the Uganda Demographic and Health Survey and National Household Survey data and integrating these with remote sensing (satellite) data provided by NASA. Proof of concept was provided by integrating these data sources with data from a small household survey conducted in 6 Western Uganda villages in 2003, 2007, and 2012 with new information on cooking technology and respiratory disease. The study provided novel insights into direct pathways linking agricultural practices, biomass fuel for cooking, and human health. This validated approach will now be used in our cohort UCCP and counterfactual areas. We will identify appropriate points of policy intervention, the magnitude of nutritional impacts resulting from policy-driven socio-behavioral changes in households and communities, and investigate higher level factors such as economic forces, market conditions and pricing, health infrastructure, and climate and weather which influence nutritional outcomes. A manuscript was submitted by Dr. Shively for publication based upon this work.

V.1.7. Econometric analyses of baseline data linking fruit and vegetable production to household food security and anemia in women.

The goal is to empirically infer potential causal linkages between fruit and vegetable (F&V) production, individual F&V intake, household food security and anemia levels for individual women caregivers of child-bearing age.

This econometric analysis led by Dr. Nassul Kabunga of IFPRI, a team member, examined the potential causal relationship between F&V production, F&V intake, household food security and anemia outcomes of individual women caregivers in rural smallholder farming communities of Uganda. Household F&V production enhanced female caregiver intake of F&V, significantly improved household food security, and significantly decreased maternal anemia.The data for this study was from the panel survey (V.1.1). Making a direct argument case for the intensification of smallholder F&V production, this analysis contributes empirically to the rare literature evaluating and drawing *actual* pathway linkages between agricultural production, nutrition and health outcomes.

This analysis finds that women caregivers aged 15-49, living in F&V producing households consume more F&Vs those living in non-producer households. Using propensity score matching and other techniques to control for bias, the study reveals that household F&V production increases F&V intake for female caregivers by 12% (from 64% to 76%). We note that many studies of enhanced food production have not rigorously addressed the issue of *consumption* of the same food in the household.

Next it methodologically contributes to the literature by using a qualitative tool, the Household Food Insecurity Access Scale (HFIAS), to quantitatively measure household food security in a comparative impact assessment framework. F&V production contributes positively to household food security, with F&V producers seen to reduce food insecurity by 0.09 index points and severe food insecurity by even a higher rate of 0.10 index points. This positive association is attributed to higher F&V intakes among those individuals living in F&V producing households. F&V are an important element to food diversity

especially for the poor. In the Ugandan context, F&V are seen as foods primarily consumed by women and children, our target group for the panel and cohort studies.

Importantly, anemia was significantly reduced in women living in F&V producer households. Mean hemoglobin levels of women living in F&V producer households increased by 0.14-0.15 g/dL, a seemingly modest yet highly significant contribution with implications for anemia in women of reproductive age. The benefits of the reduction in anemia accrued most to women who suffer from severe or moderate anemia (a well-recognized cause of death and morbidity). Indeed, no cases of severe anemia were detected in the F&V producer group of women.

This work is notable for its methodological rigor, and the careful delineation of a biologically plausible pathway linking agricultural production, to enhanced household consumption and to improved food security, and finally to a reduction in anemia in a key target population. It targeted foods most consumed by women and children. These results will first be posted to the IFPRI website as a working paper for commentary and then submitted for publication in the economic literature.

V.1.8 Ghana Peanut Value Chain Analysis

The goal was to identify opportunities for new investment and interventions to improve nutrition and livelihoods on a commercial scale (through agriculture linking to commercial enterprises). This enhances our understanding of crop value chains particularly relevant to women, and to the issues around value chains involving aflatoxin-free foodstuffs.

Team members worked with Peanut and Mycotoxin Innovation Lab members to conduct this work. This study aimed to analyze the peanut value chain in Ghana from seed to processing, so as to identify improvements needed for the introduction of increasingly nutritious products. It analyzed the agricultural policy and public-sector enabling environment around the value chain, including legal and institutional arrangements that could influence the production and distribution of new products. The study also utilized the opinions of key informants along the value chain, including details of farmers' enterprise budgets as well as potential partners' subjective perceptions of the constraints and opportunities facing new peanut-based products. The assessment concluded that new investments in the peanut value chain can be commercially viable, and provide significant improvements to the livelihoods and nutritional status of farm households in northern Ghana. It also concluded that aflatoxin contamination was a major problem within this context and the central challenge is to procure large quantities of aflatoxin-free peanuts. This will require development of a new and more secure supply chain in the midst of the larger uncontrolled market. The study found that a more robust new supply chain for aflatoxin-free peanuts is likely to involve aggregators' spot and contract purchases from rainfed smallholder producers, including particularly women farmers, potentially supplemented by other sources such as imports and contracts for production under irrigation. Building supply for this new value chain will require equipping farmers and aggregators with select new technologies to which they do not yet have access, including improved seed varieties and techniques for aflatoxin control.

The investments and interventions introduced for this innovation are likely to generate significant spillovers benefits for other households producing peanuts for other end-uses, with potentially large gains in livelihoods and nutritional status especially for women and children.

VI) Associate Award Research Project Reports

VI.1. MALAWI.

Within the context of nutrition and targeting nutrition problems, Malawi has been in the forefront. While programs to tackle acute malnutrition using community-based strategies (CMAM) have been scaled up (75% coverage per UNICEF), significant gaps remain in the public health arena around preventative nutrition. The 2010 DHS report indicates a reduction in the number of wasted and stunted children; however, almost half of the children under five are still stunted. A key strategy of the Government of Malawi (through the Department of Nutrition and HIV/AIDS, Office of the President and Cabinet) has been to develop nutrition prevention interventions targeting the first 24-months period of the life cycle. These interventions include maternal nutrition, infant and young child feeding practices, water, sanitation and hygiene. They are within the National Nutrition Policy and Strategic Plan of Malawi released in 2010. The Government of Malawi (in association with UNICEF) and other donors (Irish Aid, USAID, World Bank, CIDA) is in the process of scaling up a National Nutrition Education and Communication Strategy (NECS) as part of the implementation of "Scaling Up Nutrition," or 1,000 days initiative.

In contrast an emerging trend in Malawi is the increased risk of overweight and obesity. A review of the DHS 2010 indicates that 28% of urban women aged 15-49 are either overweight or obese compared to 14% of rural women. A preliminary literature review shows that chronic non-communicable diseases and their risk factors are emerging public health problems. A recently published study examined the prevalence of smoking, alcohol consumption, overweight and obesity, hypertension, fasting blood glucose, and cholesterol levels. It found a third of the adult population aged 25-64 years either had elevated blood pressure or were on anti-hypertensive medications, 5.6% had raised fasting blood glucoses (hyperglycemia) or were taking medication for it, and 8.7% had high cholesterol values. Another study has reported prevalence rates of 13.6% for diabetes mellitus, 4.4% for ischaemic heart disease, and 6.1% for strokes in the adult population aged 30-69 years.

A key concern raised by the DNHA (OPC) is the lack of national nutrition capacity (both pre-service and in-service). There is a lack of trained nutritionists and dietitians required for the roll out of nutrition prevention activities at scale. Another major concern at the Nutrition Unit of the Ministry of Health (which has the nutrition mandate within the health sector) is the weak nutrition education curriculum for health workers. While there have been significant changes at the policy and program level (e.g. scaling up of CMAM, food by prescription, introduction of new growth standards, infant and young child feeding promotion activities), this is not reflected in the current curriculum of the nursing and medical colleges. Graduating students often have very little or no experience in current community and facility based activities that require significant nutrition knowledge. Thus, the MOH has to re-train or provide remedial training to health care professionals. Furthermore, since health workers and paramedics do not often have long-term fixed postings, incoming new untrained workers require repetitive in-service training. Thus repetitive remedial training has to be constantly provided, and is a significant burden. Thus, if relevant nutrition training can occur during pre-service education, this would (1) allow for a better prepared workforce attuned to the current policies and practices of the MOH, and (2) decrease the burden of repetitive, remedial training of health care graduates.

Our activities are: (1) to build pre-service training capacity in Malawi through guiding the modification of existing curriculum with a focus on developing a dietetics curriculum and program, sensitive to national needs and priorities; (2) to develop capacity for implementing food and nutrition activities (e.g. clinical activities, surveillance, and consumption surveys) by helping to develop food composition tables and to support faculty and student development; and (3) to review the existing medical and nursing curriculum for nutrition content.

VI.1.1. *Dietetics Program*: Through FY 2013, the Tufts team has worked closely with the team in Bunda College, now part of the Lilongwe University of Agriculture and Natural Resources (LUANAR), in the development of the dietetics program. A needs assessment was completed for the Dietetics program. The curriculum and most courses in the curriculum as well as the framework of the implementation of the program have been developed as of the end of FY2013 and an application has been made to the LUANAR Senate. Next steps will include addressing queries by the Senate and the national accreditation body, and then move on to implementation of the program.

VI.1.2 *Capacity Building: Food Composition Table Development and Student/Faculty Support:* Activities in FY 2013 included developing a plan of action with Bunda College / LUANAR along with the support of the key Bunda food scientist to attend the food composition development course organized by FAO in Turkey (October 2012). This was followed by the hiring of two research assistants who developed the food lists by food groups. The Innovation Lab interacted with FAO in Rome and in Malawi to determine the best possible way to collaborate on this activity (given FAO's INFOODS network) and it was agreed that the Bunda College/LUANAR developed tables would be incorporated into the INFOODS network, which will be pursued in FY2014. The Innovation Lab will continue interacting with the FAO to ensure continued involvement and interest. Work will be undertaken to expand the food lists including identifying any existing nutrient composition data that can be sourced from Malawi researchers and/or from studies on the same foods from neighboring countries such as Zambia, Zimbabwe and South Africa. We have also supported several students through scholarships.

VI.1.3 *Nutrition in the Medical Curriculum*: The third component of the Malawi associate award includes working with the Malawian Ministry of Health and providing support to the College of Medicine and other ancillary health/medical colleges to review and enhance the nutrition component of the Malawian medical and nursing school curricula. A preliminary assessment has shown, while initially it was believed that this is a process of enhancement, that there is essentially no specific primary nutrition curriculum in the medical or nursing school curricula in Malawi. The majority if not all nutrition education occurs as a secondary topic within the context of other courses with other primary topic areas. The Nutrition Innovation Lab Africa has invited the Principal of the College of Medicine at the University of Malawi in Blantyre as a senior champion to facilitate these efforts and interactions are underway to get all the stakeholders to a common forum (FY 2014).

VI.2 RWANDA

Rwanda has a high population density, extensively eroded or degraded land, limited use of improved seeds and fertilizer, high transportation and energy costs, and widespread poverty. Stunting affects more than 44% of children under 5; 38% of children aged 6-59 months are iron deficient; and 20% of households suffer seasonal food insecurity. The current USAID/Rwanda portfolio emphasizes value

chains. Value chain crop foci include beans, maize, and dairy. Secondary focal crops are coffee and pyrethrum. Water and sanitation; road construction to improve market access; fertilizer access; gender equity; and national post-harvest and dairy policies have been promoted. A staple crop aflatoxins assessment is ongoing, complementing a national post-harvest processing policy. The north of Rwanda despite high agricultural productivity has high rates of stunting, and is physically adjacent to our zone of work in Uganda.

In FY 2013, the Nutrition Innovation Lab Africa had a series of discussions and interactions with the USAID Mission in Rwanda. In addition to a focus on infant and child undernutrition, there is expanding interest within Rwanda regarding maternal undernutrition. In March, June, and July 2013 meetings, USAID/Rwanda and the Nutrition Innovation Lab agreed to begin a facilitated discourse around potential activities. Based upon these discussions an initial set of proposed activities in a concept note was provided to USAID/Rwanda to provide a basis for more concrete discussions around a possible set of activities in Rwanda. The potential activities proposed secondary analysis of existing data to examine drivers of stunting, studying the integration of nutrition in the Feed the Future value chains from a markets and income lens as well as from a behavior change communication and messaging perspective, the extension of the birth cohort study in areas of Rwanda bordering south West Uganda (given similar high levels of stunting in these areas as observed in Uganda) and capacity building/training of Rwandan nutrition students and professionals. As of October 2013, there has been no formal response to the concept note.

VI.3 EGYPT.

In Egypt, the issue of stunting is compounded by the co-existence of overweight and obesity in many other countries of the Middle East and North Africa. These nations face the dual burden of under and over nutrition, often in the same population, community, household or individual. The dual burden of disease can be extremely variable in its manifestation. It can, for example, be manifested as stunted children who are concurrently obese, or as stunted children who may not be *currently* obese but who are at risk of early onset chronic diseases – such as diabetes, hypertension, renal dysfunction and cardiovascular disease - due to epigenetic programming.

Both environmental enteropathy (EE) and aflatoxin exposure are believed to cause stunting. Researchers in Egypt have evaluated childhood EE in a pilot study. EE was present in 96% of the children sampled, and found to improve with a simple set of nutritional supplements. EE is a state of chronic gut inflammation, which saps children of nutrients and growth. Children fail to grow normally when they are recurrently exposed to human or animal infectious pathogens through living in an unsanitary, un-hygienic environment. Egypt suffers from a deteriorating water and sanitation infrastructure. In addition, Egyptian researchers have published more than a dozen studies documenting the presence of aflatoxins in common Egyptian foods, and in Egyptian adults, pregnant women, children, malnourished children, and from breast milk.

A series of meetings were held with USAID Egypt and a key issue raised was the similar prevalence of stunting in both high and low socio-economic status households. The Nutrition Lab – Africa then proposed a set of activities in a preliminary concept note. These included an initial in-depth literature

review, analysis of Egyptian food and nutrition policy (including but not limited to subsidies, food prices, regulatory frameworks promoting a nutritious and safe food supply), infrastructure related to water and sanitation; and their potential effects relating to environmental contaminants such as aflatoxins and environmental enteropathy, stunting, overweight and the 'double burden' of disease.

Proposed high-impact primary data collection studies revolve around:

1. Assessing existing or on-going studies, programs, and interventions for actual or potential impact, to prioritize high-impact interventions beneficial in Egypt.
2. Evaluation of environmental enteropathy (EE) as a cause of stunting in Egypt.
3. Evaluation of the role of aflatoxins in causing stunting in Egyptian children, and the specific foods of highest risk.
4. Relationships between fat mass, lean mass, fat oxidation and stunting (addressing the issue of stunting and overweight in the same individual).
5. Outlining the individual, community, and social factors that increase the risk of households having both stunting and overweight/obesity in the same household.

We anticipate that an Associate Award will likely be made in FY2014.

VII) Human and Institutional Capacity Development

VII.1.1 Training: The Nutrition Innovation Lab Africa continues to support Ugandan academics and students for short term and long term support.

- Short-Term: A total of 129 individuals were trained in child health and nutrition topics through short-term support of the Nutrition Innovation Lab Africa. These included 56 women and 73 men. Types of training included nutrition research methods workshop held in Bangalore, India in January 2013 and summer courses at the Harvard School of Public Health.
- Long –Term: There are a total of 11 men and 8 women in long-term training (PhD and Masters) at Tufts University, Makerere University and Tuskegee University.

VII.1.2 Institutional Development and Collaborations: The Nutrition Innovation Lab Africa has been quite active in this regard. More specifically:

- The Nutrition Innovation Lab Africa has supported the development of the curriculum for a short nutrition course at the School of Public Health, Makerere University that targets mid-level personnel from districts and NGO workers looking to expand their knowledge of public health nutrition and related interventions. A pilot course was held in June 2013 with 15 students (2 international from Korea). It was noted in the evaluation that is the only short course that appears in a Google search and that there are very few short courses on Public Health Nutrition.
- The Nutrition Innovation Lab Africa is actively engaging researchers from Makerere University, Gulu University and planning collaborations with Mbarara University in the ongoing data collection activities on the birth cohort study.
- The Nutrition Innovation Lab Africa has supported the training of local staff (enumerators and data collectors) in the area of nutrition, health and agriculture. Many of these enumerators belong to Ugandan small companies, non-profits and academic institutions.

- The Nutrition Innovation Lab Africa Management Entity and its partners have allocated time and effort to providing technical support to key US-based partners, such as SPRING and FANTA III by supporting their training and knowledge dissemination activities that seek to build capacity within USAID and its partner organizations to better implement, measure and learn from Feed the Future and other federal strategies for international development.
- Strong collaborations have been developed with the Peanut and Mycotoxin Innovation Lab (through the Ghana Peanut Value chain activity and the aflatoxin analyses in East Timor) as well as the Livestock and Climate Change Innovation Lab with the Nutrition Innovation Lab-Africa providing input on the RFA on nutrition and microbiome of animals and humans.
- The Nutrition Innovation Lab Africa has actively sought interactions with CGIAR centers including IITA through the Africa Rising initiative. Potential exists for doctoral student support for activities relating to nutrition and agriculture within the initiative.
- The Nutrition Innovation Lab Africa worked actively with the Nutrition Innovation Lab Asia and the Peanut and Mycotoxin Innovation Lab in the development and implementation of activities with the University of Jakarta linked to a national survey on nutrition in East Timor. East Timor has some of the highest, if not the highest, rates of stunting in the world. We developed a protocol for the analysis of serum samples for aflatoxin exposure, and statistical analysis to examine the relationship between aflatoxin levels in mothers, their children and their growth indicators, specifically stunting.

VIII) Technology Transfer and Scaling Partnerships

Unlike other Innovations Labs, which focus on generating new varieties of seeds, techniques for pest control or tools for market analyses, the Nutrition Lab's main intellectual property relates to dissemination of research findings that directly impact policy and program design, and the methods of implementing both. Our innovations are in general intellectual rather than physical.

IX) Governance and Management Entity Activities

The management entity tasks for Year 3 of the program were implemented smoothly by Tufts. Research and training funds were effectively disbursed among the many partners, leaving *no carryover* at the end of FY13. It should be reiterated that synergies and cost-savings accruing to having a single Management Entity for both Nutrition Innovation Labs have been substantial. Both the Lab for Africa and for Asia have benefited from the synergistic sharing of ideas among multiple partners.

As noted in the Y3 workplan, the Nutrition Innovation Lab Management Entity (ME) Asia and Africa was able to:

- Host one Board of Directors and one Technical Advisory Committee (TAC) Meeting in April 2013. This occurred following the metrics workshop (see below). The TAC focused on examining the direction of the Nutrition Innovation Lab Asia and Africa's research agenda (as described earlier) while the Board of Directors (BOD) focused on the processes of implementation. Policy decisions aimed at more transparency and enhanced guidance for all stakeholders were discussed and formalized by the Board of Directors. Specifically, we reviewed new Student Recruitment Guidelines. Once reviewed, the Board voted to approve them. Discussions were held on the student recruitment process and the requirements that USAID has when an institution accepts a

student for training in the US. Because this can be a confusing process, the process was clearly outlined and posted on the Innovation Lab website. Discussions were also held on the idea to create a template for researchers to propose research that would add-on to the original Innovation Lab programs.

- In Y3, the Nutrition Innovation Lab Africa ME has focused on streamlining contracting and reporting of partners and has been better able to work with Uganda-based partners (such as IFPRI Uganda and Makerere) on reporting and administration.
- The Nutrition Innovation Lab website has been restructured and enhanced. Individual webpages are now available for Asia and Africa. Key reports, briefing papers and presentations are regularly uploaded on the website.

In addition to the governance and management activities, key events were hosted by the Nutrition Innovation Lab Africa in 3 global scientific meetings (in conjunction with the Nutrition Innovation Lab Asia):

- Metrics Workshop: The Nutrition Innovation Lab Africa along with the Nutrition Innovation Lab Asia hosted the 2nd metrics workshop in April 2013 as a satellite to the Experimental Biology meetings in Boston. Attendees included representatives from LCIRAH, FAO, USAID Washington DC (BFS, Global Health), core partners (Johns Hopkins, Purdue, Tuskegee, Harvard School of Public Health) and other University partners (UK). There were five overarching themes, which emerged from the formal presentations and discussions. These include:

    - Data Revolution: need for improved data quality and standardization of data collection methodologies
    - Relevant Indicators: Identification of the most relevant indicators
    - Use of the generated evidence and need for advocacy
    - Focus on study design and methodology in the evaluation of multi-sector policy and programming
    - Elucidating the theory and logic of transmission mechanisms and acknowledging the complexity of the relationship of agriculture, nutrition and health.

- A special session at the 20th International Congress on Nutrition: The 20th International Congress of Nutrition was held from September 16-21, 2013 in Granada, Spain. As part of the satellite sessions to the symposium, the Nutrition Innovation Lab for Asia and Africa co-jointly organized a symposium titled “Research in Nutrition, Health and Agriculture”. The aim of the session was introduce the Nutrition Innovation Laboratory activities to the larger nutrition community. Attended by about 70-80 participants, the symposium included opening remarks by Dr. Tirtha Raj Burlakoti, Chief Specialist, Policy, Planning and International Cooperation Division, MoHP and a key note address by Mr. Raj Kumar Pokharel, Chief, District Health Office, DoHS/MoHP, Illam, Nepal. In addition, Professors Patrick Webb and Jeffrey K. Griffiths presented on linking agriculture- health and nutrition. Professor Webb’s presentation framed the need for rigorous empirical evidence to confirm the linkages across the three areas, while Professor Griffiths’ presentation laid out emerging areas including environmental enteropathy, mycotoxins and the gut microbiome. Following the laying out of the research agenda, Drs. Klemm and Ghosh

presented on the design and preliminary findings around the PoSHAN study in Nepal (a community and institutional panel survey) and Dr. Ghosh presented preliminary findings of the core baseline panel survey in Uganda. The session was attended by academics especially from Asia and Africa and USAID and USDA staff. The session generated significant discussion around the importance of food based approaches in addressing nutrition issues. Professor Bernard Bashaasha, the Makerere University PI for our work in Uganda, was to give the keynote address on nutrition challenges in Uganda, but regretfully was unable to attend because of a delayed opening of the University.

- The Nutrition Innovation Lab Africa and Asia and Tufts University presented in the CGIAR (Consultative Group on International Agricultural Research) Science Forum 2013. Held in Bonn from Sept 23-25, 2013, the biennial forum brought together scientists, practitioners, experts and thought leaders in order to understand the challenges and advances in the areas of nutrition, agriculture and health. The theme of Science Forum 2013 was "Nutrition and health outcomes: targets for agricultural research". The aim was to agree on research needs and identify new approaches and partnerships through which the agricultural community especially the CGIAR community could add value to the delivery of nutrition and health. Professor Patrick Webb delivered the keynote lecture of the Forum titled "Agriculture and nutrition: What do we know now and what do we still need to know". The Nutrition Innovation Lab Africa was represented in one more session, with Dr. Ghosh presenting a case study titled "Studying effectiveness: considerations in research design and implementation" in a plenary session focused on "Evaluating Nutrition and Health Outcomes". In addition, Professor William Masters organized as well as presented a session on "Farm Size, Urbanization and Links from Agriculture to Health and Nutrition". Significant interest was generated by all four presentations with several researchers, scientists, students and development partners following up with individual researchers for advice and collaboration.

The Nutrition Innovation Lab Africa was represented in more than 5 US Government agency focused events including 2 Innovation Council meetings in Tanzania and Ghana, 1 USAID Special event in Washington DC, and BIFAD and Innovation Council Meetings in Des Moines, Iowa. Many other events, conferences and fora were used by the Nutrition Innovation Lab Africa for the presentation and dissemination of research and capacity building activities which at times also borrowed on insights from Asia. A list of events, presentations and the numbers reached are provided in Appendix 1.

The Director of the Nutrition Innovation Lab Africa was elected to lead the Innovation Council in July 2013 during the annual Innovation Council Lab Directors meetings. Prof. Griffiths will serve as the chair of the Council and the Innovation Lab will take the lead in organizing the annual meeting in 2014 (FY2014) in Nepal and the transition related to the anticipated larger number of new Innovation Labs.

The Management Entity has also continued to play an important role in representing core partners at meetings in Des Moines, Washington DC, London and Bonn, and in organizing partner participation in key meetings where they can engage directly with donors or researchers interested in this Lab's domain of work.

X) Other Topics (impact assessment, gender initiatives)

Not applicable

XI) Issues (financial, management, regulatory)

In Year 3, the Management Entity was able to award more than 68% percent of the total Nutrition Innovation award to direct work in Uganda. As in past years and similar to the Nutrition Innovation Lab Asia, the majority of the labor of the ME, is allocated to cost share and is not part of the main labor budget. Key positions such as the Associate Director, Program Manager, and a majority of the co-Programs Director's salary is taken as cost share. The majority of the funds were given to Innovation Lab partners to be used toward capacity building and research in-country. Some of the other major expenses were dedicated to costs associated with promoting and disseminating Nutrition Innovation Lab research results such as the workshop the ME sponsored at the Nutrition Congress in Spain and the Metrics Workshop held in Boston in conjunction with the Experimental Biology Conference. The ME directly supported six students from Uganda to attend the nutrition research methods (Bangalore Boston Nutrition Collaborative at the St Johns Medical College) in India, supported the doctoral research of Mr. Natamba in Uganda, hosted training and workshops, and conducted numerous presentations as well as supported one Ugandan student for MPH studies at Tufts.

XII) Future Directions

Primary data collection will continue and expand in Y4, serving to build rich longitudinal datasets that will directly inform core aspects of Feed the Future's agenda. This includes both our own core work and that of supported projects such as the Gulu birth cohort. Furthermore, important analysis of secondary datasets is underway (led by Purdue University in collaboration with NASA) dealing with national level patterns and trends of agricultural productivity, climate change and health/nutrition outcomes. We will continue to build relevant partnerships and conduct activities which inform or enhance our core objectives. Our innovative research activities have had high global visibility through presentations in major academic and policy meetings, leading to continued requests for collaboration, extension of research add-ons (such as aflatoxins, microbiome, and Associate Award activities). Efforts will continue to be made to achieve additional relevant Associate Awards from other country missions in the region and to collaborate with appropriate partners.

Appendix 1: List of presentations made on Nutrition Innovation Lab – Africa research activities

Presenter	Event	Place	Title	Date	Size of Audience
Agaba, E	Northern Uganda research dissemination	Agago district, Uganda	NILA-Baseline results presentation for district leaders	August-13	20
Agaba, E	South-western Uganda research dissemination	Kamwenge district, Uganda	NILA-Baseline results presentation for district leaders	August-13	33
Agaba, E	South-western Uganda research dissemination	Kisoro district, Uganda	NILA-Baseline results presentation for district leaders	August-13	30
Agaba, E	Northern Uganda research dissemination	Lira, Uganda	NILA-Baseline results presentation for district leaders for Lira for Lira, Kole and Dokolo districts	August-13	49
Agaba, E	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Kampala, Uganda	Influence of family care practices, age & relationship of the caregiver to the child on the nutrition status of rural children under 2 years in Uganda	June-13	62
Agaba, E	District Research dissemination workshop	Southwest and northern Uganda	NILA-Uganda Panel Study: Baseline 2012 overview	August-13	80
Bashaasha, B.	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Kampala, Uganda	Maternal diet and Complementary Feeding Habits of Breast Feeding mothers in Uganda	June-13	62
Duggan, C	Jodhpur National University	Jodhpur, India	Maternal and child health in India	September -13	200
Duggan, C	Hubei Maternal and Child Health Hospital	Wuhan, China	Nutritional status of pregnant women and children: role of nutrient supplementation	May-13	100
Duggan, C	Boston-Bangalore Nutrition Collaborative Course	St. John's Research Institute, Bangalore, India	Multiple lectures on child nutritional status assessment, trial design and manuscript development	January-13	80

Fawzi, W.	Federation of American Societies for Experimental Biology (FASEB) Symposium	Boston, MA	Diet and Inflammation: New Concepts on the Impact of Nutrients on Immune Modulation,	July-13	250
Fawzi, W.	Federation of American Societies for Experimental Biology (FASEB) Symposium	Boston, MA	Global Perspectives on Preterm Birth and Fetal Growth and Restriction	July-13	200
Fawzi, W.	2013 Symposium	Boston, MA	Nutrition and Global Health Priorities." Harvard School of Public Health.	July-13	200
Fawzi, W.	HIV/AIDS and Maternal Health Conference. Simmons College	Boston, MA	HIV/AIDS, Nutrition and Maternal Health Care.	June 2013	100
Fawzi, W.	Inter-science Conference on Antimicrobial Agents & Chemotherapy (ICAAC) of the American Society for Microbiology (ASM)	Denver , CO	Evidence for vitamins and nutritional supplements in the treatment and prevention of infections, "Vitamins, micronutrients & HIV infection in resource poor settings."	September -13	150
Ghosh, S	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Kampala, Uganda	Essential agricultural and livelihood actions, key modifiers, and intermediate determinants of maternal and child nutritional status and anemia in rural Uganda	June-13	62
Ghosh, S	1st Annual Meeting of the Innovation Council	Morogoro, Tanzania	Global Nutrition Innovation Lab Africa and Asia	13-Mar	200
Ghosh, S	1st Annual Meeting of the Innovation Council	Morogoro, Tanzania	Linking Health Nutrition and Agriculture	13-Mar	200
Ghosh, S	2nd Annual Meeting of the Innovation Council, Ghana	Accra, Ghana	Building Agriculture- Nutrition Linkages: Evidence Base	13-Jul	200
Ghosh, S	International Congress on Nutrition, Spain	Granada, Spain	Nutrition Innovation Lab Africa: Baseline Findings of the First Panel Survey	13-Sep	60
Ghosh, S	Science Forum of the CGIAR Science Council, Bonn, Germany	Bonn, Germany	Studying effectiveness: Considerations in research design and implementation	13-Sep	200

Ghosh, S	USAID special event	Washington, DC	Animal Source Protein and Stunting	13-Aug	120
Ghosh, S	USAID/Tufts Metrics Workshop	Boston, MA	Nutrition Innovation Lab Research Framework/Core Metrics	13-Apr	80
Griffiths, J.K.	Seminar at USAID	USAID / HQ	Water	January-13	50
Griffiths, J.K.	Boston-Bangalore Nutrition Collaborative Course	St. John's Research Institute, Bangalore, India	Global Health and Nutrition	January-13	80
Griffiths, J.K.	Safe Global Water Summit	Arusha, Tanzania	Water: Linking Agriculture, Nutrition and Health	February-13	120
Griffiths, J.K.	Ag and Nutrition Global Learning and Evidence Exchange (AgN-GLEE)	Guatemala City, Guatemala	The role of water in linking agriculture, nutrition and health (virtual presentation)	March-13	200
Griffiths, J.K.	Meeting with USAID/Rwanda	Kigali, Rwanda	Global Nutrition Innovation Lab Africa & Asia	March-13	6
Griffiths, J.K.	Teaching Water: Global Perspectives on a Resource in Crisis. (Course for K-12 Teachers in Massachusetts)	Harvard College, Cambridge MA	Water, Climate Change and its Impact in Africa: What Does It Mean? http://vimeo.com/74071242	August-13	25
Griffiths, J.K.	International Congress on Nutrition, Spain	Granada, Spain	Sanitation, Mycotoxins, Environmental Enteropathy, and the Gut Microbiome	Sep-13	60
Griffiths, J.K.	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Kampala, Uganda	Malaria predicts maternal and child anemia in Uganda and is modulated by altitude	June-13	62
Griffiths, J.K.	Meeting at USAID/Egypt	Cairo, Egypt	Global Nutrition Innovation Lab Africa & Asia	June-13	5
Griffiths, J.K.	Ag and Nutrition Global Learning and Evidence Exchange (AgN-GLEE)	Kampala, Uganda	The role of water in linking agriculture, nutrition and health	December-13	200
Griffiths, J.K.	Dissemination Workshop Makerere University	Kampala, Uganda	Nutrition Innovation Lab – Uganda Panel Study: Baseline 2012	June-13	60
Griffiths, J.K.	Dissemination Workshop Makerere	Kampala, Uganda	Malaria predicts maternal and child anemia in Uganda and is modulated	June-13	60

	University		by altitude and prior IRS.		
Griffiths, J.K.	AgriLinks Webinar USAID HQ	USAID/HQ	Why isn't food enough? Mycotoxins, Environmental Enteropathy & the Gut Microbiome	August-13	
Gunaratna, N / Ghosh, S	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Kampala, Uganda	Relationships Between Agriculture and and Child Stunting in Rural Uganda	June-13	62
Nassul, K	Research Symposium	Kampala, Uganda	The significance of fruits and vegetables (F&Vs) in diets of rural Ugandan households	June-13	62
Natamba, B	Annual Nutrition Research Symposium	Cornell University; Ithaca, NY	Reliability and validity of measurement scales for maternal food insecurity and depression among HIV –infected and –uninfected pregnant women attending ANC services in northern Uganda	March-13	50
Natamba, B	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Makerere University, Kampala	Food insecurity, prenatal nutrition, and psychosocial health outcomes of HIV-infected and –uninfected pregnant women in northern Uganda: Preliminary results from the Gulu PreNAPs study	June-13	62
Natamba, B	Nutrition Innovation Lab Dissemination Workshop and Research Symposium, Makerere University	Kampala, Uganda	Differential impacts of maternal HIV status, food insecurity and diet diversity on weight changes during the prenatal period. Results from the PreNAPs study in Gulu, Northern Uganda	June-13	62

Appendix 2: List of awards

1. *Makerere University, Uganda*: Research 2012 - 2015, $333,990 in Y3; ($1,036,368 total)
2. *Harvard University:* $90,085 in Y3 ($562,503 total)
3. *Purdue University:* $74,247 in Y3 ($235,449 total)
4. *Tuskegee University:* $22,000 in Y3 ($135,072 in total)
5. *IFPRI:* $95,626 in Y3; ($250,435 total)

Appendix 3: Success Stories

NUTRITION INNOVATION LAB – AFRICA
Annual Report (FY 2013) Success Story No. 1

Status of graduate training in Uganda under the Feed the Future Food Security Innovation Laboratory: Collaborative Research on Nutrition-Uganda

Uganda's youngest generation of researchers are being supported by the Feed the Future Food Security Innovation Laboratory for Collaborative Research on Nutrition - Africa. It currently supports 14 Ugandan graduate students in Uganda (13 MSc or MPH, and 1 PhD) in public health nutrition, applied nutrition, agriculture extension, and agricultural economics. Students were supported by the Nutrition Innovation Laboratory to develop appropriate conceptual and analytical frameworks; design their research; support data collection and analysis; and present their findings. Student research topics included: food safety; gender roles and decisions, and impacts on household food security and nutrition; determinants of undernourishment; household consumption patterns; crop and dietary diversity; Vitamin A nutrition education; HIV, food insecurity, and birth outcomes; and mycotoxin exposure. Others focused on program implementation and agricultural extension. Student research is spread across 38 Feed the Future districts (out of Uganda's 112 districts). Students publicly presented their research at a research symposium organized by the Nutrition Innovation Laboratory on June 28th 2013 in Makerere University, Kampala Uganda. The benefit achieved from this support is illustrated in the comments highlighted below:

Elizabeth Atim, a MSc Student from the School of Food Technology, Nutrition and Bio-Engineering at Makerere University said: "***I appreciate the fact that nutritional issues concerning Uganda were being shared with different people moreover from a scientifically proven point of view. I personally learnt a lot about my study area and what to expect; but was also able to identify research gaps and intervention areas (for improved nutritional outcomes)... The experience for me was not simply a learning one; it enabled me to come out of my 'shell', meet people, network and build wonderful academic relationships which I am extremely grateful for***."

From Joshua Ssemakula, Student of MSc. Applied Human Nutrition, Makerere University:***"It was a great opportunity for me to learn how to incorporate agriculture, nutrition and health into my research work… critiques on my presentation from the congregation especially those from professors at Tufts helped me to further get a better insight and understanding of my research direction in terms of refining my justification for the study and research methods."***

Elizabeth Asiimwe, MSc student of Agriculture Extension, stated:

"***A lesson was also learnt from the proposal presentations … when I was given constructive advice on how best to go about my study. It was also a chance to meet many researchers and share contacts and research ideas…What a great forum it was!"***

(Photos: Jeffrey K. Griffiths 2013)

NUTRITION INNOVATION LAB – AFRICA
Annual Report (FY 2013) Success Story No.2

Six Ugandan professionals trained in 2 weeks International Nutrition Research Methods, January 2014, Bangalore India

This 5th International Course was conducted through the Bangalore Boston Nutrition Collaborative at Saint John's Research Institute, Bangalore India. The Ugandan professionals were selected from Ministry of health (1), local districts officials (2), academic and research institutions (Makerere (1) and Gulu Universities-2). The students were trained to explore link between nutritional factors and health outcomes. They were also trained on evaluating scientific literature and exploration of demographic, epidemiological, biological, social, political, and economic determinants. Students also gained knowledge on public health nutrition research including: clinical nutrition, physiology, biochemistry, and molecular nutrition. Emphasis was also not only placed on methodological skills of nutritional, infectious disease, and chronic disease epidemiology but also on interpretation and synthesis of research findings, potential mechanisms, and study design limitations and how to integrate research findings to inform public health recommendations and program design and implementation.

Biribawa Claire. Uaanda

Arthur Bagonza, Makerere university school of public health "I *wish I could find fault with the course. Unfortunately, I cant. I really want to thank everyone that was involved in organising that course. It never left me the same!!"….. to sum it up all, on a scale of 1-10 (1 being the worst and 10 the best) I rate the organization and the course at 11*".

Christine adyedo, Assistant District Health Officer, Luwero district "...*this opportunity was very good and informative especially to me who had not had hands-on in the area of nutrition. The course also gave us a wide exposure on how information can be got when conducting both a scientific and even non scientific studies as well, how to publish scientific papers, all this information was very timely and I as an individual appreciate the opportunity because I will be able to use the knowledge I acquired beyond the field of nutrition"*


Some participants from Uaanda

Biribawa Claire from Gulu University, "*The course fueled my inspiration to actually advance in Nutrition. All the modules that were presented were very relevant to the field that I am in right now……am really grateful for having been given this chance to attend the course because it has really impacted on my skills, knowledge and nutrition application".*