

# **Feed the Future Innovation Lab for Collaborative Research on Grain Legumes (Legume Innovation Lab)**

## **FY 2017 WORKPLAN**

### **Project Code and Title:**

SO4.1 Impact Assessment of Dry Grain Pulses CRSP investments in research, institutional capacity building and technology dissemination for improved program effectiveness

### **Lead U.S. Principal Investigator (PI) and affiliated Lead U.S. University:**

Mywish Maredia, Professor, Agricultural, Food and Resource Economics (AFRE), Michigan State University

### **Host Country and U.S. Co-PIs and Institutions:**

Eric Crawford (Co-PI), Agricultural, Food and Resource Economics, Michigan State University

US and HC PIs/collaborators of other Legume Innovation Lab Projects

## **I. Project Problem Statement and Justification:**

Impact assessment is essential for evaluating publicly-funded research programs and planning future research. Organizations that implement these programs should be accountable for showing results, demonstrating impacts, and assessing the cost-effectiveness of their implementation strategies. It is therefore essential to document outputs, outcomes and impacts of public investments in research for development (R4D) activities. Anecdotal data and qualitative information are important in communicating impact to policymakers and the public, but must be augmented with empirical data, and sound and rigorous analysis.

The proposed research contributes towards evidence-based rigorous ex ante and ex post assessments of outputs, outcomes and impacts with the goal of assisting the Legume Innovation Lab program and its Management Office (MO) to achieve two important goals--accountability and learning. Greater accountability (and strategic validation) is a prerequisite for continued financial support from USAID and better learning is crucial for improving the effectiveness of development projects and ensuring that the lessons from experience – both positive and negative – are heeded. Integrating this culture of ‘impact assessment’ in publicly funded programs such as the Legume Innovation Lab and generating knowledge outputs will ultimately help increase the overall impact of such investments.

## **II. Planned Project Activities for the Workplan Period**

### **Objective 1:**

Provide technical leadership in the design, collection and analysis of data for strategic input and impact evaluation

### **Collaborators:**

Juan Osorno (NDSU), Julio Martinez (ICTA), and Byron Reyes (CIAT)  
Nicole Mason and David DeYoung, Michigan State University

## Approaches and Methods:

Following activities from previous years will be expanded and / or completed in FY 17.

- 1a. Analysis of baseline study in Guatemala:** A baseline survey of more than 500 farm households to study the constraints and opportunities for research to contribute to increased productivity of climbing beans in Guatemala was conducted in 2015 jointly with the SO1.A1 project team under their objective ‘*Genetic improvement of climbing black beans for the highlands of Central America.*’ Data cleaning and organization is completed and a poster paper highlighting the preliminary results of this survey was presented at the Pan African Legume Conference in Zambia in March 2016. In FY 17, this project plans to complete the data analysis and generate a working paper for wider dissemination. This will be a joint activity with the SO1.A1 team (Juan Osorno (NDSU), Julio Martinez (ICTA)), and Byron Reyes (CIAT). The analysis will focus on the current status of the climbing bean/maize intercropping production system (i.e., the *milpa* system) in the highlands of Guatemala. Data concerning cultivated area, production practices, production problems/constraints, seed quality and culinary preferences along with the socio-demographic characteristics of farm households will be analyzed using descriptive and econometric techniques to help establish priorities for the climbing bean breeding program.
- 1b. Analysis of existing data for strategic insights to guide impactful research on legume based farming systems:** The movement towards sustainable intensification as promoted by many donor funded projects, including USAID’s FTF programs in some countries, is based on the premise that integrating legumes in crop rotation and as intercropped with cereals can have much needed soil fertility and nutrition benefits to farmers adopting these practices. There is, however, little empirical evidence documenting these claims. As part of FY 17 workplan, this project plans to continue rigorous panel data analyses to provide strategic insights on following question: What are the productivity, nutrition, and income effects of the adoption of legume based intensification technology (such as legume-cereal intercropping and rotation).

Existing panel datasets from LSMS-ISA surveys in Tanzania, Uganda and/or Malawi will be used to address these questions. In the case of Malawi, the LSMS-ISA data can be used to explore how subsidies not just for maize inputs but also for legume seed (which started being included in the Malawi FISP input packs a few years ago) affect long-term adoption and incomes, and not only adoption in the year of the subsidy but in subsequent years.

The PI will collaborate with Nicole Mason from MSU AFRE Department on this activity. She has experience working in East and Southern Africa, and expertise in conducting panel data analysis using rigorous econometric methods.

## Objective 2: Conduct ex ante and ex post impact assessments

### Collaborators:

Robert Shupp, David DeYoung and Nathalie Mensope, Department of Agricultural, Food and Resource Economics (MSU), Byron Reyes and J.C. Rubyogo, CIAT, Paul Kusolwa and Fulgence Mishili, SUA, Tanzania, Francis Kusi, SARI, Ghana, Ilboudo Dieudonne and Clementine Dabire, INERA, and researchers from SO1.A4, SO1.B1 teams

### Approaches and Methods:

In FY 17, following research studies and activities will be conducted under this objective.

**2a. Sustainability of legume seed system constraints and opportunities to guide policies and programs:** Two studies were initiated/completed in FY 15 (Tanzania and Ghana) under this broad theme and the plan is to continue/extend this work in FY 17 as described here.

- i. *Willingness of small holder farmers to pay for quality seed:* This will be an expansion of the study conducted in Tanzania in previous years to assess farmers' willingness to pay for quality seed over grain. The methodology/ approach to address this research question consists of first conducting field experiments in farmers' fields to demonstrate the value of planting different types of seeds of the same vs. grain saved from previous harvest (representing different years of recycled seed) or purchased from the market, and then conducting bidding experimental auctions (BEA) to test farmers' willingness to pay for different types of seeds (i.e., certified seed, quality declared seed and recycled seed). In FY 17, the plan is to complete the analysis of this study conducted in Ghana for cowpea, and expand this research in Nicaragua for beans. The study in Nicaragua will be conducted in collaboration with CIAT and INTA.

The geographic focus will be the Northwest of Nicaragua, described in

Table 1. The specific number of villages per municipality will be determined later on, as we depend on the villages where potential collaborators work. In these municipalities, as in most of the country, the first season (Primera) goes from May to July and the second season (Postrera) goes from August to November. Because of budget limitations, the DEMO and BEA will focus on one municipality in each department (for a total of two municipalities) and selecting ten villages in total.

Table 1. Proposed study sites and number of villages, Nicaragua

Municipality	Department	
	Jinotega	Madriz
La Concordia	5-8 villages (TBD)	n.a.
Yalaguina	n.a.	2-5 villages (TBD)

Notes: TBD=to be determined; n.a.=not applicable

Interest from other legume innovation lab country collaborators (INERA in Burkina Faso and NSS in Haiti) to conduct similar WTP studies has been expressed. However, this research will be expanded to these additional two countries contingent upon budget availability.

- ii. Case study on community based seed system: The BTB project in Nicaragua used Community Seed Banks (CSB) to multiply and disseminate improved varieties of *Apta* (i.e., Quality Declared Seed) bean seed to farmers. Between 2011 and 2013, existing CSBs were supported or new CSBs estimated in 234 communities. An estimated 16,065 farmers obtained seed from the CSBs representing 23% of farmers cultivating beans on 10 MZ (7 hectares) or less. A study of the cohort of CSBs established in the first year of the BTB project reinforce the importance of seed marketing training, production of quality seed, inclusive transparent operations, and experience leadership as factors contributing to the longevity, and thus sustainability, of CSBs. While these results were important, the study was limited to a time period in which the CSBs received external financial and technical support.

To further understand the factors contributing to sustainability of CSBs, and specifically, after external financial support ends, we propose a follow up study in collaboration with CIAT, of the CSBs that participated in the BTB project. Specifically, the study will interview representative of the 34 CSBs from the first cohort that operated all three years in the BTB project (agricultural seasons 2011-13). An additional 34 CSBs will be selected using a proportional selection method of location and years of operation of the additional 114 CSBs operating at program end 2013, but not included in the original study because they began operations in 2012 or 2013.

A structured questionnaire will be developed to collected data on the operation of CSBs after 2013 without direct external support of the BTB project. Seed production and dissemination data, as well as descriptions of changes in the leadership and operations of the CSBs will be collected. Additionally, any collaborative agricultural or non-agricultural group activities not related to seed production that continue among the CSB members will be documented to identify community impacts beyond the strengthening of the local seed systems.

**2b. Adoption study in Haiti:** In collaboration with the SO1.A4 team, this proposed study was initiated in FY 16 and will be completed in FY 17. The study is designed to generate systematic and rigorous evidence on the use of improved bean varieties by farmers in Haiti. Specific objectives of this study are:

- a. To conduct a survey of bean farmers in Haiti and collect information on farm characteristics, bean area, varieties planted, sources of seed, criteria farmers use in making seed use decisions (type, quantity, source, etc.), varietal trait preferences, and perceptions on seed quality, price, availability, and constraints.
- b. To conduct an assessment of the bean seed supply chain to understand the seed system characteristics, supply and demand side constraints, institutional players involved in different nodes of the supply chain (i.e., producers/multipliers of different generation of seeds, distributors, traders, sellers, and buyers), and strategies/approaches used by the seed suppliers and users to meet the country's need for quantity and quality seed
- c. To collect bean seed samples throughout the seed supply chain (i.e., seed producers, distributors, traders, seed and grain vendors, agro-dealers, and farmers) and conduct DNA fingerprinting analysis to identify the genetic identity of bean varieties planted by farmers and available in the 'seed system.'

- d. To estimate the extent to which bean seeds of improved varieties are used by farmers and are in circulation in the seed system, and identify major constraints and opportunities for increasing the adoption of quality of bean seeds by farmers in Haiti.

Activities in FY 17 will mostly focus on objectives b, c and d. Specifically, it will include:

1. *Bean seed supply chain assessment* to get a good understanding of the relative importance of the formal and informal bean seed channels, major players involved in each, how the bean seed flows within and between the formal and informal channels, and types of bean seed varieties available in the system. This will require different methods, approaches and sources of information as outlined below:
  - i. Bean seed source patterns (how farmers are linked with upstream seed supply chain), types of seed varieties grown by farmers, how farmers use the harvested grain, and how they are linked with the supply chain downstream. This information will be obtained from the farm surveys conducted in FY 16.
  - ii. Seed/grain market analysis: Since a bulk of seed planted by farmers are procured from the market and sold after harvest, the plan is to do a systematic assessment of the bean varieties available in the market, pricing patterns, sourcing areas, and seed quality management procedures followed by the seed/grain vendors. The plan is to piggyback on the existing market information system infrastructure managed by NASS called Systeme D'information Sur Les Marches Agricoles (SIMA), and collect bean seed samples and information from bean vendors from whom the seed samples are collected. The plan is to do this seed sample and information collection from bean vendors at least 6 times in each market for the 12 month period starting in August 2016. A sub-set of the seed samples collected from the markets will be subjected to seed quality test and DNA fingerprinting for varietal identification. The sampling plan and the logistics of doing this seed/grain market analysis study are to be further developed with input from NASS and NSS, and will be contingent upon budget availability.
  - iii. Key informant interviews with major institutional players involved in the formal bean seed system in Haiti. This includes agro-dealers, international and national NGOs, IICA, FAO, donor funded programs (e.g., Change Life), Ministry of Agriculture and NSS. A combination of face-to-face or phone interviews and emails or online survey will be used to gather information on the scope, scale and size of seed production, multiplication and distribution efforts by these players. For a sub-sample of organizations in each category, the plan is to also request or collect bean seed samples promoted by these different entities and seed programs and conduct DNA fingerprinting analysis and seed quality tests. The methodology for this sub-component is still to be developed, and will also depend on budget availability.
2. *DNA fingerprinting*, which is routinely used by plant breeders and is becoming widely available and affordable, offers a reliable method to accurately identify varieties grown by farmers. The use of this method can thus increase the accuracy and credibility in the interpretation of results of adoption and impact studies based on household surveys. We thus plan to supplement the data collection approaches outlined under objectives a and b with DNA fingerprinting of bean seed samples collected from farmers, markets and different nodes of the formal and informal seed supply chain. This component of the Haiti study will be done in close collaboration

with the SO1.A4 team. Protocols for collecting seed samples, labeling, handling, shipping and storage of seeds from the point of collection to NSS facilities in Haiti, and then shipping these seeds to Puerto Rico (where seeds will be germinated and DNA extracted), and from there the shipment of DNA samples to lab facilities where DNA fingerprinting will be conducted will be worked out with SO1.A4 team. Cost estimates have been provided for the DNA analysis, which range from \$10-15/sample depending on the sample size. Across the farmer survey, market survey and the different nodes of the supply chain, we anticipate collecting a large number of seed samples (more than 5000). We will thus need to come up with a strategy to sub-sample the collected samples for DNA analysis. The number of seed samples that will be DNA fingerprinted will be based on available budget and a scientifically meaningful sampling method. Since this component was not originally planned and budgeted for this study, we have requested the Management Office for additional support.

The DNA analysis will include bean seed samples (preferably breeder seeds) of all the released and/or promoted varieties in Haiti and neighboring countries either through private sector, Zamorano, UPR, CIAT or other breeding programs in the region (e.g., DR, USA, Mexico, Guatemala). Also, any known improved landraces introduced or indigenous varieties in Haiti will be included in the reference library as long as the source of these seeds can guarantee its identity. Dr. Emmanuel Prophete is compiling a list of all the varieties (improved, introduced in Haiti) that will potentially be included as the reference materials for DNA fingerprinting.

3. *Assessment of bean varietal adoption by farmers and seed system analysis.* The output of this study will be reflected in reports (followed by peer reviewed publications) that will be generated based on the data and results from data collection and analysis of objectives 1-3. This output will be generated in FY 17 and will include:
  - i. Overview of the bean seed system in Haiti (different players, formal and informal channels of seed supply)
  - ii. Importance of different sources of seed for farmers
  - iii. Estimates of the adoption and prevalence of different types of bean seed varieties in the seed system in Haiti.
  - iv. Adoption outcomes of targeted seed distribution efforts (e.g., BTD)
  - v. Assessment of seed system constraints and opportunities for improvement

## **2c. Follow-up survey in Burkina Faso for impact assessment of biocontrol IPM**

**research:** Cowpea (*Vigna unguiculata*) is an important staple in Burkina Faso as well as many other countries in West Africa. Among the major cowpea pests affecting the crop are the legume pod borer (*Maruca vitrata*), flower thrips (*Megalurothrips sjostedti*), bruchids (*Callosobruchus maculatus*), and pod-sucking bugs, for which conventional plant breeding has not been effective and the use of pesticides has economic, health and environmental limitations. Through support from the predecessor CRSP and the current Legume Innovation Lab, the SO1.B1 project team has developed alternative strategies to control these insect pests and reduce the levels of pesticide used on the crop. One of these strategies includes implementing a comprehensive bio-control program. As part of this strategy, the SO1.B1 team has recently released bio-control agents in selected locations in Burkina Faso where baseline data were collected by this project in 2012. The sample design covers a total of 560

households distributed across 56 villages and 10 provinces. In FY 17, the plan is to conduct a follow-up survey (in collaboration with INERA) of the same farmers in 56 communities to be able to evaluate the impacts of bio-control research using difference-in-difference methodology. The baseline data collected in 2012 will serve as the ‘before’ scenario, which will be compared with an “after” scenario in 2017.

The main purpose of this proposed impact evaluation study is to measure the farm level effects of bio-control IPM strategy to control *Maruca vitrata*. Data will be collected on: (1) the incidence and severity of damage caused by biotic (particularly insects) and abiotic stresses; (2) the use of insecticides; farmers’ knowledge/awareness about beneficial insects to control cowpea pests; (3) pesticide management practices; (4) toxic health effects from pesticide use (misuse); and, (5) use of labor during cowpea production. Other economic indicators include the quantity of cowpea grain produced, revenues from grain sales, input and transportation costs, and relative importance of cowpea as a source of income and food security.

**Objective 3:** *Build institutional capacity and develop human resources in the area of impact assessment research*

**Collaborators:** NARS and CIAT partners

As in previous years, this project will address the objective of institutional capacity building and human resource development through the following activities planned in FY 17:

- a. Research activities under objectives 1 and 2 will involve host country PIs/collaborators in the planning and conduct of field data collection as much as possible. During the data analysis phase, HC collaborators will be given opportunities to visit MSU and get some hands-on training by working jointly with US PIs and collaborators with the goal of generating scholarly outputs.
- b. Activities planned under this project will involve graduate students in the planning and conduct of field research and write-up of research results. These students will be recruited from within the Department of Agricultural, Food and Resource Economics at MSU (see the details on trainees in the Training section).

### **III. Contribution of Project to USAID Feed the Future Performance Indicators:**

None

### **IV. Outputs:**

Specific outputs to result from this project by the end of FY 17 include:

- a. Completion of two manuscript for publication in academic journals and/or presentations at professional meetings
- b. Completion of impact briefs based on published papers

### **V. Engagement of USAID Field Mission(s)**

No specific plans for engagement of USAID Field Mission(s) are envisioned in FY 17. Project activities in host countries will mainly involve data collection, accessing secondary data, and

information gathering through stakeholder interviews. Data collection will be done in collaboration with HC partners in countries where Legume Innovation Lab is already engaged and where activities are occurring in concurrence with USAID country or field missions.

## **VI. Partnering and Networking Activities:**

All the activities occurring in specific countries through field research will involve collaboration with host country institutions and partners. Host country institutions will not only be involved in the planning and design of data collection efforts, conducting surveys, data entry and report writing, but also in the dissemination of results to broader audience and stakeholder groups. Opportunities will be sought to present papers based on this project's research results in national and international policy and professional forums.

Results emanating from this impact assessment research project will be published in the form of Impact Briefs and will be posted on the Legume Innovation Lab website. They will be also shared with appropriate USAID mission offices through the Legume Innovation Lab Management Office and host country partners.

## **VII. Leveraged Resources:**

The Master Card Foundation has awarded a scholarship to a Ghanaian student for a two year M.S. degree in the Department of Agricultural, Food and Resource Economics at MSU under the mentorship of M. Maredia. This project will leverage this scholarship opportunity to undertake and complete the WTP study in Ghana planned under Objective 2 (activity 2a).

In addition, the project PIs will be actively engaged in identifying opportunities to partner with other international impact assessment and Grain Legume research programs/projects and seek for opportunities to leverage resources to achieve common research goals.

## **VIII. Timeline for Achievement of Milestones of Technical Progress:**

See the attached excel file

## **Appendix 1: Workplan for Training and Capacity Strengthening (FY 2016)**

### **Degree Training:**

First and Other Given Names: Edward

Last Name: Opoku

Citizenship: Ghana

Gender: Male

Training Institution: Michigan State University

Supervising CRSP PI: Mywish Maredia

Degree Program for training: M.S..

Program Areas or Discipline: Agricultural Economics

If enrolled at a US university, will Trainee be a "Participant Trainee" as defined by USAID? No

Host Country Institution to Benefit from Training: None

Thesis Title/Research Area: the student will assist in the WTP of quality cowpea seed in collaboration with SARI, Ghana



Start Date: Fall 2015  
Projected Completion Date: Fall 2017  
Training status (Active, completed, pending, discontinued or delayed): Active  
Type of CRSP Support (full, partial or indirect) for training activity: Indirect

First and Other Given Names: Sean  
Last Name: Posey  
Citizenship: USA  
Gender: Male  
Training Institution: Michigan State University  
Supervising CRSP PI: Mywish Maredia  
Degree Program for training: M.S.  
Program Areas or Discipline: Agricultural Economics  
If enrolled at a US university, will Trainee be a "Participant Trainee" as defined by USAID? No  
Host Country Institution to Benefit from Training: None  
Thesis Title/Research Area: (TBD) The student will assist in various research activities planned under objectives 1 and 2  
Start Date: Fall 2016  
Projected Completion Date: Fall 2018  
Training status (Active, completed, pending, discontinued or delayed): Pending  
Type of CRSP Support (full, partial or indirect) for training activity: Partial

First and Other Given Names: Brian  
Last Name: Bartle  
Citizenship: USA  
Gender: Male  
Training Institution: Michigan State University  
Supervising CRSP PI: Mywish Maredia  
Degree Program for training: M.S..  
Program Areas or Discipline: Agricultural Economics  
If enrolled at a US university, will Trainee be a "Participant Trainee" as defined by USAID? No  
Host Country Institution to Benefit from Training: None  
Thesis Title/Research Area: (TBD) The student will assist in various research activities planned under objectives 1 and 2  
Start Date: Fall 2016  
Projected Completion Date: Fall 2018  
Training status (Active, completed, pending, discontinued or delayed): Pending  
Type of CRSP Support (full, partial or indirect) for training activity: Partial

**Equipment** (costing >\$5,000): None