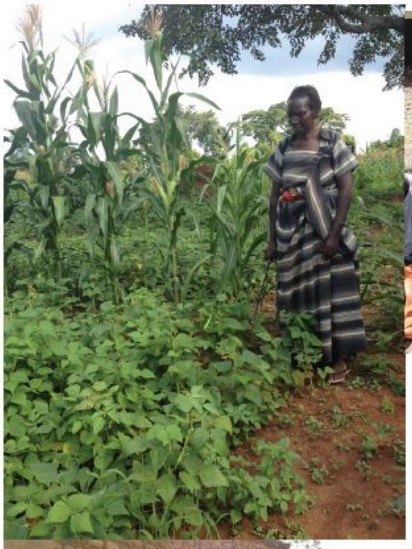
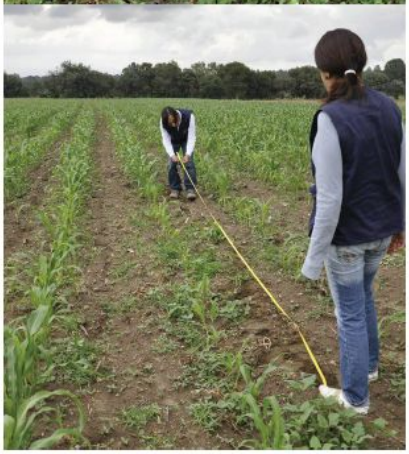




Feed the Future Innovation Lab
for Collaborative Research on Assets and Market Access

University of California Davis

BASIS

ANNUAL REPORT
2015

MANAGEMENT ENTITY INFORMATION

Director:	Michael Carter
Assistant Director:	Tara Steinmetz
Financial Analyst:	Christine Helsing
Communications & Outreach:	Sophie Javers
I4 Post-Doctoral Fellow:	Thomas Barre
GAN Post-Doctoral Fellow:	Quentin Stoeffler

TECHNICAL AND/OR ADVISORY COMMMITTEE INFORMATION

Standing Board of Directors

- Craig McIntosh, University of California San Diego
- Jolyne Sanjak, Millennium Challenge Corporation (MCC)
- David Ameyaw, Alliance for a Green Revolution in Africa (AGRA)
- Lena Heron, USAID Bureau of Food Security

LIST OF PROGRAM PARTNERS

BASIS primarily contracts with United States universities, which then work with myriad research and implementation partners in their country of research. These collaborative partnerships play an essential role in BASIS's success.

UNITED STATES UNIVERSITY PARTNERS

- Columbia University
- Cornell University
- George Washington University
- Michigan State University
- Ohio State University
- Stanford University
- University of California Berkeley
- University of California Davis
- University of California San Diego
- University of Georgia
- University of San Francisco
- University of Washington
- Weber State University
- Yale University

Many of these United States based university partners have additional partners elsewhere in the U.S. with whom they collaborate. Those listed above are our direct partners (awarded the contract from BASIS).

INTERNATIONAL PARTNERS BY COUNTRY

Bangladesh: BRAC, International Rice Research Institute (IRRI)

Burkina Faso: Innovations for Poverty Action (IPA), Institut de l'Environnement et de Recherches Agricoles (INERA)

Dominican Republic: USAID, International Research Institute for Climate and Society (Columbia University), Swiss-Re, GuyCarpenter, CaribRM, REDDOM, CESDEM

Ethiopia: International Livestock Research Institute (ILRI), Oromia Insurance Company (OIC), AfricaRe

Ghana: African Center for Economic Transformation (ACET), Ghana Agricultural Insurance Programme (GAIP), University of Ghana (UofG), Innovations for Poverty Action (IPA), the Ministry of Food and Agriculture, International Food Policy Research Institute (IFPRI), Savannah Agricultural Research Institute.

Haiti: Faculté d'Agronomie et de Médecine Vétérinaire (FAMV) at Université d'Etat d'Haïti, Oxfam America, Quisqueya University and State University of Haiti, Fonkoze

India: Agricultural Insurance Company of India (AICI), Center for Microfinance (CMF),

Kenya: Tegemeo Institute (Egerton University), Western Seed Company, Maseno University, Mumias Sugar Company, Innovations for Poverty Action (Kenya)

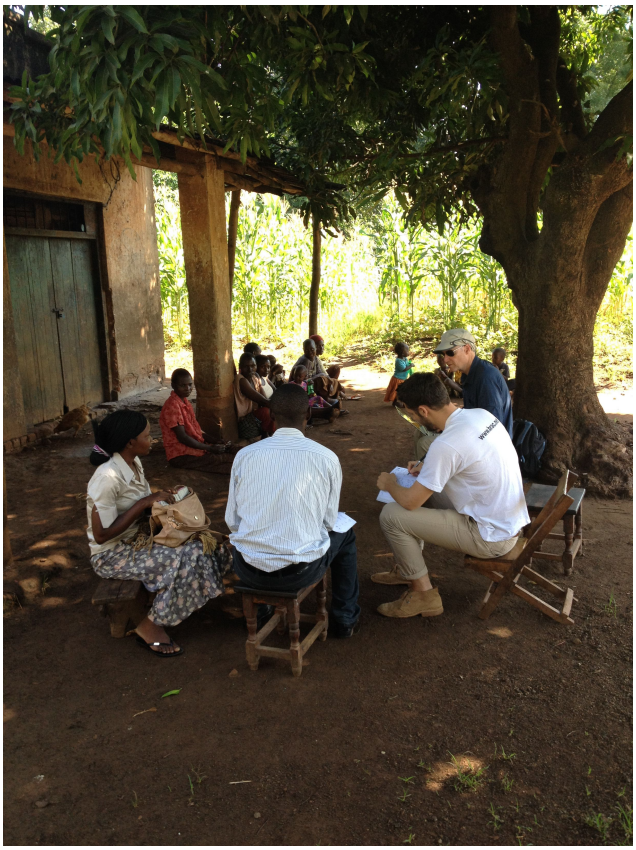
Malawi: IFPRI, Lilongwe University of Agriculture and Natural Resources, Malawi Department of Land Resources and Conservation, National Smallholder Farmers' Association of Malawi

Mexico: Fertilab, Agroquímica, Qué Funciona para el Desarrollo

Mozambique: International Fertilizer Development Center (IFDC), Banco Oportunidade de Moçambique (from Opportunity International)

Nepal: USAID mission, Nepa School for Social Sciences and Humanities, Heifer International

Senegal: Consortium pour la Recherche Economique et Sociale (CRES)



Tanzania: Sokoine University of Agriculture, University of Dar es Salaam, Institute of Rural Development Planning (IRDP)

Uganda: Economic Policy Research Center (EPRC), BRAC, Makarere University

ACRONYMS

AMA: Assets and Market Access

BASIS: Building Access and Strengthening Input Market Systems (historic AMA Innovation Lab organizational name)

BFS: Bureau of Food Security

DTM: Drought Tolerant Maize

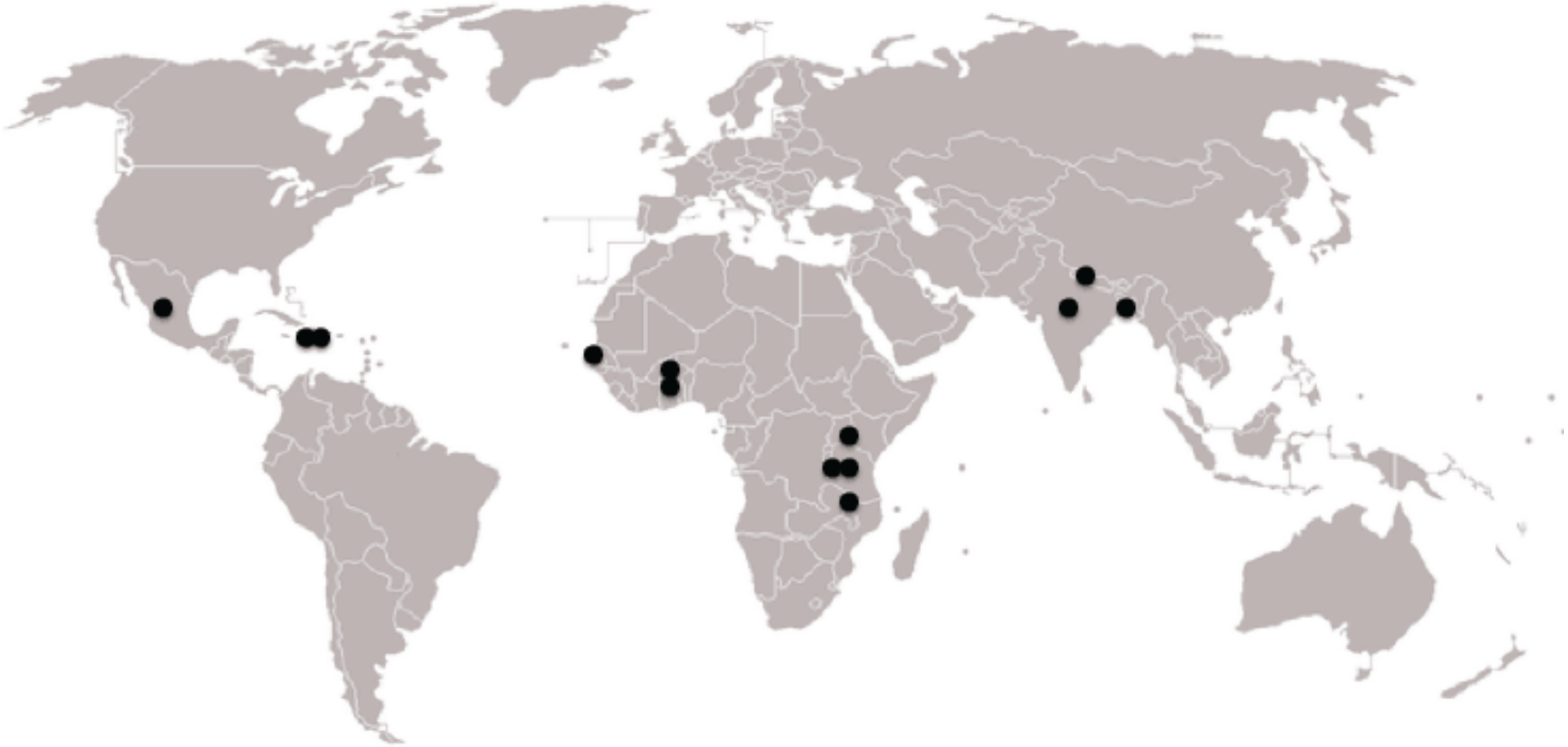
GAN: Global Action Network

I4: Index Insurance Innovation Initiative

USAID: United States Agency for International Development

WTP: Willingness to pay

COUNTRIES WHERE BASIS WORKS



List of Countries

Bangladesh, Burkina Faso, Dominican Republic, Ghana, Haiti, India, Kenya, Malawi, Mexico, Nepal, Senegal, Tanzania, Uganda

BASIS

BASIS Assets and Market Access Innovation Lab

Executive Summary

While many organizations in the agricultural sector focus on moving the technological frontier upward into realms of increasingly higher returns, producing superior yield seeds for example, there has been less of an emphasis on research to understand how to help farmers actually realize that maximum potential. The BASIS AMA Innovation Lab has assembled a portfolio of projects that focus on key topics designed to bridge the gap between what is possible given currently available technologies and the experiences of most developing country agriculturalists.

Advancing the technological frontier will in the long run improve rural livelihoods and food security. Despite significant advances in existing technologies expanding what is possible, however, average small farm yields fall well below what is possible because of low adoption of these technologies. The BASIS AMA Innovation Lab believes that more importance must be placed on helping farmers close these yield gaps. By better understanding and addressing the constraints to the adoption of agricultural technologies, we can raise the capacities and capabilities of smallholder farmers, bringing increased productivity and security to those most in need.

BASIS research is identifying strategies and interventions to reduce this yield gap. Some of the key topics covered in the BASIS research portfolio include the following:

• **Risk and Liquidity**: Farmers are often hesitant to adopt beneficial technologies because they are seen as prohibitive income and production gambles. New financial instruments like index insurance and other support systems such as improved credit access are helping to mitigate these un-hedged risks, allowing farmers to take on prudential risk and invest more securely in their futures.

BASIS looks forward to increased synthesis of lessons learned across projects, and improved dissemination of these results and lessons to the broader stakeholder community in the continued goal of closing the yield gap for smallholder farmers.

• **Beliefs and Behavior**: Cultural, behavioral, and educational factors have significantly constrained farmers' acceptance of new technologies. Effective mechanisms are being tested to improve the smallholder farmer's knowledge and decision-making about the acquisition and deployment of advanced technologies. Research into combating the cultural and behavioral limitations to technology adoption are also proving very promising - allowing farmers, for example, to overcome traditional prejudices against buying new higher-yielding seed.

• **Profitability**: The yield gap can be particularly immovable when available technologies, once applied, do not actually benefit farmers. Poor soil, lack of access to markets, and unprofitable input prices, all hinder a farmer's ability to sustainably improve food and wealth security. Tailoring technologies to take into consideration agro-ecological differences enables those modified technologies to be successfully scalable in heterogeneous conditions. The adaptation of new mechanisms for small farmers to collectively capture economies of scale, navigate local commercial systems, and remain a part of the value chain, is an encouraging area of research that will help to relax constraints and allow the yield gap to close further.

This year BASIS also received an exciting new associate award that aims to explore the potential complementarities between agricultural and financial technologies to stabilize agricultural households and open opportunities for investment and growth. This study will explore determinants of uptake of these technologies, as well as to measure the impacts on on-farm investment levels and nutritional outcomes.
As projects approach the end of their implementation timelines over the next two years, BASIS looks forward to increased synthesis of lessons learned across projects, and improved dissemination of these results and lessons to the broader stakeholder community in the continued goal of closing the yield gap for smallholder farmers.

PROGRAM ACTIVITIES AND HIGHLIGHTS

B A S I S

Because the BASIS Assets and Market Access Innovation Lab is still in the middle of implementation, many of the main activities are related to ongoing work and project management. Management of the subawards is ongoing, and AMA is preparing for dissemination activities in the near future.

PROGRAM ACTIVITIES

The primary activities from the past year include increased definition for relatively new projects, ongoing relationship building with USAID missions, and the usual project management activities for awards in the middle of their implementation timelines.

Giving Greater Definition to New Research Projects

Though BASIS had completed its core portfolio at reporting time last year, there are a number of new projects that have taken steps to more clearly define their project parameters and design interventions that will contribute to important research questions. More in-depth information on each of these will be presented in greater detail later in this report.

- **Craig McIntosh, University of California San Diego (Uganda)**
  This is a study of a multi-pronged intervention that aims to build sustainable, private-sector solutions to some of the intermediation issues that have plagued African food markets. The three prongs of the study (improving information; improving the methods of long-distance transactions; providing reputational and financial guarantees) will work to simultaneously alter the intermediaries, the information, and the contracting options available in food markets.
- **Elisabeth Sadoulet, University of California Berkeley (Bangladesh)**
  In this project, researchers will explore (with BRAC and IRRI partners) how to design and offer a portfolio of risk-handling instruments to smallholder farmers and rural inhabitants. Over the past year, researchers and partners have defined and developed the financial products with partners, created a credit scoring system for financial system clients, and set up the administrative systems necessary to pilot this innovative financial product.
- **Michael Carter, University of California Davis (Mozambique and Tanzania)**
  A new Associate Award for the BASIS AMA Innovation Lab, this activity will support the implementation of a multi-year, spatially diversified randomized controlled trial of two proven, complementary, stress-resistant technologies; drought tolerant maize seeds and index insurance fine-tuned to cover the high stress conditions when drought tolerant maize fails. Since the award was made researchers have successfully laid the groundwork for launching the initial year of on-farm experimentations in the next year.

Mission Relations

The BASIS AMA Innovation Lab has been maintaining its ongoing relationships with USAID missions to conduct research with valuable implications both within the host country and with broader implications for the developing world. Previous collaborations with missions in the Dominican Republic and Nepal have continued to advance (as described later in this report), and BASIS has been conducting additional conversations about a potential mission-supported future

impact evaluation to be conducted on a USAID intervention for orphans and vulnerable children in Mozambique.

Ongoing Project Management
Most BASIS AMA Innovation Lab projects are in the middle of their implementation timelines. BASIS management is staying in close contact with their researchers around the country and around the world to ensure projects are progressing as expected, and to work with researchers to address issues or challenges as they arise.

PROGRAM HIGHLIGHTS

New Associate Award

In the spring of 2015, Dr. Michael Carter and the BASIS AMA Innovation Lab received an Associate Award ($2,250,000 for the period 2015 – 2019) from USAID-HQ. This project is titled "Achieving Development Impact with Complementary Stress-Resistant Seed & Financial Technologies: A Proposal to Learn from the DT Mass Scaling in Mozambique and Tanzania."

This study takes a novel approach to answering the question of how agricultural interventions can be designed to improve nutritional outcomes for individuals in farm families and communities as a whole. Most often, researchers approach this question by considering interventions or technologies that will, in a typical crop year – or on average – increase the local availability of nutritionally dense foods, or increase the incomes of rural families. Here we instead consider the nutritional impact of scaling up "stress resistant" agricultural technologies that are designed to stabilize production and incomes in bad years.

Researchers and partners hope this approach will reduce the human development losses that occur during periods of drought and other types of climatic stress that reduce incomes for both farm and landless labor families. In addition, stress-resistant technologies can induce behavioral change on the part of producers who intensify production, raising incomes and food availability in average, non-stress years. Researchers will seek to determine if stress-resistant technologies are a cost-effective approach to meeting nutrition and health goals.

Defining Safe Minimum Standards (SMS) for Index Insurance

BASIS researchers are collaborating with other researchers and implementers from around the world to develop a better understanding of the value of insurance from farmers' perspectives. They are developing a methodology to analyze the quality of index insurance products called "SMS" or Safe Minimum Standards. Such standards would also allow for comparison between different products.

SMS considers the reservation price for an insurance contract; this is the maximum price that an individual could pay for the given contract without making him or herself worse off. At this level, the wellbeing of the person is equal with and without insurance. The Safe Minimum Standard is that this reservation price is no less than the market price. BASIS researchers have recently presented this work to a broader stakeholder community and are looking forward to considering and incorporating feedback as these standards are developed.

KEY ACCOMPLISHMENTS

B A S I S

The key accomplishments of the BASIS AMA Innovation Lab in the past year have primarily been around synthesizing different lessons learned to date across issues and taking the next logical steps to incorporate lessons from individual projects and translating them into broader lessons to inform development policy and programming.

Safe Minimum Standards for Index Insurance

While index insurance is promoted as an affordable alternative to conventional insurance in developing countries, its value for farmers is rarely assessed. BASIS researchers have suggested a framework to measure index insurance quality to help design and compare insurance products, called "Safe Minimum Standards" or SMS.

The value of an insurance product for a smallholder farmer stems from the protection it offers on her consumption and assets. A risk management tool like insurance can prevent farmers from taking costly coping strategies such as selling assets or eating less, which deplete physical and human capital, jeopardize future consumption, and can be very painful. Index insurance usually operates at the agricultural production level and insurance quality has to be assessed based on how well insurance payments correlate with agricultural production.

Index insurance cannot protect farmers as well as a perfect insurance product, but the objective is to build a metric that allows stakeholders to compare index insurance products against a perfect product, and to know how far the design is from achieving the desired consumption stabilization objectives.

Associate Award to Examine Complementarities of Technological and Financial Innovations

To date, there has been significant work on both technological and financial innovations, but research has not explored their complementarities nor traced their impacts on nutrition. BASIS AMA Innovation Lab has received an associate award to take advantage of an opportune and researchable moment: there are new drought tolerant (DT) maize varieties ready to go to market and there is growing knowledge of how to design effective insurance products for small-scale agriculture.

Charged with reducing vulnerability and improving food security, the Drought Tolerant Maize for Africa (DTMA) project has developed 140 DT maize varieties with impressive field trial success. However, under extreme drought conditions (which may occur as much as 20% of the time in some African maize-growing regions), new DT varieties, like conventional varieties, fail. It is under these conditions that novel financial technologies, like index insurance, can potentially complement and deepen the impacts of DT seed technologies on the livelihood prospects and vulnerability of poor farmers.

The proposed study (in Mozambique and Tanzania) will determine the uptake and impacts on nutritional outcomes of DT varieties alone an din combination with complementary financial technologies.

Generating Knowledge on a Number of Cross-Cutting Topics

The BASIS Assets and Market Access Innovation Lab portfolio has now assembled a set of projects that will provide knowledge across a number of cross cutting themes. We're optimistic that there can be lessons drawn from across these projects that can be turned into broader lessons learned and applied to development policy and programming.

Some of these themes include the following:

- Nutrition
- Gender
- Hope/Aspirations
- Farmer Learning
- Collective Action/Public Goods
- Agricultural Extension
- Plot-Specific Soil Information

By synthesizing lessons and themes across a number of projects, BASIS hopes to draw key pieces of policy-relevant information and effectively communicate them to stakeholders.

Learning About Hope and Aspirations

For the poor, the contradiction between gloomy prospects and daily consideration of and concern for their future welfare is a source of cognitive dissonance. Why plan for the future if you see no hope for improvement? Currently, two BASIS projects have considered the impact of hope and aspirations on behavior and wellbeing in the developing world.

The first, a recently completed project in Mozambique, sought to examine how poor farmers plan for the future. Researchers considered the "time horizon" of study participants, based on the response to the question "How much time ahead do you plan your future expenditures?" Previous research found that this question has a strong impact on actual savings. Receipt of the interventions in this study – an agro-input subsidy and/or a matched savings account, increased the time horizon of the small producers by 29 percent. These results point out just how crucial it is to know why behavior changes in order to promote lasting change. By better understanding the behavioral changes, which can have a multiplier effect, we can better design policies that make the best use of this mechanism.

In the second project, as part of an impact evaluation of Heifer International's asset transfer program in Nepal, researchers provided a test of an aspirations failure theory. The analysis suggested that the readily observable assets (wealth) of others in a peer group are very important for an individual's own wealth aspirations. On the other hand income, which is not as easily observable by outside peers, is not important for an individual's income aspirations. They also found support for the hypothesis that the "aspirations gap" is what drives future-oriented behavior.

This BASIS research is making important contributions to a growing body of literature that recognizes the potential significance of psychology in economic decision-making.

Research Program Overview

The University of California Davis Management Entity manages the BASIS AMA Innovation Lab according to the following principles, as outlined in the original proposal to USAID:

1. *Open competition* to select the highest quality research projects to create a portfolio that implements the vision of the BASIS AMA Innovation Lab;
2. *Engage USAID Missions* with dedicated outreach to identify innovative pilot activities that complement their strategic goals and programming under Feed the Future;
3. *Project Monitoring* to ensure sound technical progress, achievement of impact, and contribution to program and agency goals;
4. *Commitment to Innovative, High Quality Research* that generates policy relevant results, with lessons drawn out for maximum utility by policymakers and programmers; and,
5. *World-Class Leadership* by an established faculty member with the global reputation, knowledge, and commitment needed to mobilize and mold the highest quality research program.

Management Structure

Management Entity

The BASIS AMA Management Entity currently includes of 6 individuals. The office includes 4.7 FTEs, including a 50% Director, full-time Assistant Director, 60% Financial Analyst, 60% Communications and Outreach Specialist and two full-time post-doctoral fellows.

The Director takes primary responsibility for the technical oversight of the projects. He closely reviews all proposals and work plans of the selected projects for technical soundness, and continually reviews the projects through both Technical Committee meetings and direct communication with researchers throughout the life of the project. The Assistant Director is responsible for the day-to-day operations of the AMA CRSP. She is responsible for budget monitoring and providing the Director with necessary information to make funding and other management decisions. She ensures that all projects meet reporting requirements, and are making progress toward specific benchmarks that were approved at the beginning of the project. This is done to make sure that each project continues to make progress towards demonstrable impact.

The Financial Analyst provides contracts and grants administration, including taking the lead on managing outgoing subcontracts, modifying existing subcontracts, and working with University of California Davis offices on their oversight. She is also responsible for invoice approval and tracking of subcontract spending. The Communications and Outreach Specialist is responsible for the coordination and implementation of communications activities, including reports, presentation, research, writing, etc. She is also responsible for

managing and generating website content, managing social media platforms, assisting with events planning, generating program publications, and other relevant support, as needed.

The Post-Doctoral fellows work in collaboration with the Director and USAID staff to engage in outreach to USAID missions in response to demands for technical analysis of possible index insurance solutions and project design.

Board of Directors

The BASIS AMA Innovation Lab also has a standing Board of Directors, which consists of four members recognized for their expertise in the areas relevant to the work of BASIS, including international development, economics, sociology, and other development-related social science disciplines. The Board includes Craig McIntosh (University of California San Diego), Jolyne Sanjak (Millennium Challenge Corporation), and David Ameyaw (Director; Strategy, Monitoring and Evaluation Unit, Alliance for a Green Revolution in Africa). The Board also includes the AMA CRSP's AOR, Lena Heron to ensure that the direction of the AMA CRSP remains compatible with the goals of USAID and Feed the Future.

Since the funding start of the BASIS AMA Innovation Lab, the Board has met via telephone conference (to accommodate geographic diversity of board members) and has also had important email correspondence to review, advise and consent on management matters. The telephone meetings were to select research projects for the BASIS AMA project portfolio. With the advice of an ad hoc proposal evaluation panel of external experts, the board selected a portfolio of research projects that allow for topical and regional balance. The board also focused on identifying proposals that had clear policy relevance and had the potential to identify recommendations that can increase development impact in the areas of focus.

Technical Committee

The Technical Committee is comprised of the U.S. and host country PI for all BASIS AMA activities. This committee is responsible for peer review of all projects, including annual review of work plans. The committee meets annually to present most recent findings, discuss methodologies, and get feedback and suggestions on the next phases of their research. These committee meetings are an excellent opportunity for researchers to network, discuss ongoing work, provide feedback and lessons learned, and identify opportunities for collaboration or continued information sharing.

RESEARCH THEME A: FINANCIAL INNOVATIONS IN RISK MANAGEMENT

In low-income agricultural economies, risk can be a driving force to keep small-scale agricultural households poor. Uninsured risk can prompt protective self-insurance strategies that eschew remunerative, but risky, opportunities. In the face of disasters such as drought, these households often adopt costly coping mechanisms with long-term negative impacts. Stricken households may sell productive assets in order to smooth their consumption, or rely on international food aid. Without those productive assets, these households may fall deeper into poverty. Also, after a disaster households may reduce meals, which could compromise the next generation through long term negative health impacts including underdevelopment for children under five.

Researchers at BASIS have designed, implemented, and are now evaluating a new generation of livelihood optimized index insurance contracts. Potential impacts may include improved technology uptake by farmers, increased farmer incomes, attraction of more lenders into rural markets, reversal of the dynamics that create destitute families, and reduction of the massive costs of direct aid programs. BASIS AMA Research Program assembles leading researchers from around the country with research projects around the world to generate knowledge about what works and what doesn't in index insurance.

Projects Under Theme A

- *Index-Based Livestock Insurance: Adaptation and Innovations for Ethiopia*
  Chris Barrett, Cornell University
- *A Quasi-Experimental "Post-Mortem" Study of a Discontinued Insurance Product in Haiti*
  Emily Breza, Columbia University
- *Feasibility Study on Agricultural Index Insurance in Nepal*
  Michael Carter, University of California Davis
- *Promoting Adoption of Improved Production Technologies Among Smallholders in Ghana via Coupled Credit and Index Insurance Contracts*
  Mario Miranda, The Ohio State University
- *Selling Formal Insurance to the Informally Insured (India)*
  Mushfiq Mobarak, Yale University

INDEX-BASED LIVESTOCK INSURANCE: ADAPTATION AND INNOVATIONS FOR ETHIOPIA

Lead Institution	Cornell University
Principle Investigator	Chris Barrett
Country	Ethiopia
Mechanism Under Investigation	Index-Based Livestock Insurance
Timeline	2010-2015
Commodity	Livestock

BACKGROUND

The Borena plateau of southern Ethiopia is a vast pastoralist territory comprised of arid and semi-arid ecological zones with a bimodal rainfall pattern. Pastoralism is the key livelihood, dominated by large cattle herds and increasing numbers of goats and camel. Livestock comprise the overwhelming majority of households' non-human capital and account for more than two-thirds of their average income. Livestock, however, are subject to frequent, severe shocks, especially drought. The importance of developing effective livestock mortality risk management is amplified by the apparent presence of poverty traps in these areas. Previous research identified multiple herd size equilibria such that losses beyond a critical threshold – typically 8 to 16 heads of cattle – tend to tip a household into collapse. Livestock losses that push households below this threshold amount appear to be irreversible, or to at least have very severe, long-term consequences.

In January 2010, a consortium of technical partners with commercial partners in Kenya and globally to launched a pilot Index-Based Livestock Insurance (IBLI) product for pastoralists in arid and semiarid Marsabit District of northern Kenya. This IBLI product had many innovative features:

- It is one of the first to develop the index insurance product from longitudinal household data so as to minimize basis risk in product design.
- It is one of the first developed to protect the productive asset holdings of the poor and vulnerable rather than just their income streams.
- It is one of the first to be based on more spatially distributed remotely-sensed vegetation data, rather than rainfall series from a sparse set of fixed point meteorological stations, as the IBLI index is derived from satellite-based normalized differenced vegetation index (NDVI) series that summarize the state of rangeland forage availability at high resolution.

This Ethiopia pilot project builds on lessons learned from a highly innovative pilot venture underway in northern Kenya, and adapts that pilot to the Ethiopian context.

PROJECT SUMMARY

The highly innovative IBLI Kenya (Marsabit) product has attracted considerable commercial and policymaker attention and was very well received by the target clientele, selling more than 2000 policies to individual herders in the first, six week marketing campaign. The proposed IBLI Ethiopia pilot project builds on lessons learned from that highly innovative pilot venture and adapts it to the Ethiopian context. While the target pastoralist population in Ethiopia faces similar risks associated with catastrophic herd die-offs in a relatively undiversified, livestock-dependent economy, this new product will be launched in a vastly different institutional and infrastructural context. By building in partners able and keen to adapt and extend IBLI to still-other livestock-dependent low-income settings, the project is designed to maximize potential for rapidly scaling uptake and impact.

After spending close to two years developing the IBLI-Ethiopia agenda, the Cornell-ILRI team designed a suitable NDVI-based contract to help pastoralists manage the risks of severe forage shortage, including widespread livestock loss. The team partnered with Oromia Insurance Company (OIC) for the commercial sales of the IBLI product in Borena region of Ethiopia.

RESEARCH QUESTIONS & INTENDED IMPACTS

This project will permit comparative assessment of IBLI performance in different institutional and economic contexts, laying the foundation for disseminating IBLI across Africa and other regions around the world with significant poverty and livestock populations.

In this setting, the returns to an effective program that insures pastoral and agro-pastoral population against drought-induced livestock losses can be substantial. Researchers hypothesize that IBLI can:

1. **Stabilize Asset Accumulation and Enhance Economic Growth**: Insuring assets against catastrophic loss addresses the high risk of investment in such environments. This should improve incentives for households to build their asset base and thereby climb out of poverty.
2. **Stem the Downward Spiral of Vulnerable Households into Poverty**: Because it provides indemnity payments after a shock, livestock insurance should help stem the collapse of vulnerable-but-presently non-poor households into the ranks of the poor following a drought (or related crisis) due to irreversible losses from which they do not recover.
3. **Crowd-in Finance for Ancillary Investment and Growth**: The negative effect of a risky environment on investment incentives is not limited to households. Private creditors are presently unwilling to lend for ventures such as lorries for livestock marketing cooperatives or equipment in part due to the risk associated with drought shocks that could ruin borrowers capacity to repay their loans. If linked to new lending initiatives, insurance could "crowd-in" much-needed credit for enterprises in the region without leaving pastoralist households excessively vulnerable to losing assets when nature fails them.
4. **Reinforce Extant Social Insurance Mechanisms**: Rural Ethiopia has a rich tapestry of social insurance mechanisms, both in the form of complex livestock lending and gifting traditions and burial societies, all of which provide significant insurance against idiosyncratic risk. Such institutions can easily become overwhelmed by massive covariate shocks, however, thus providing effective insurance against otherwise-uninsured covariate risk can reinforce the viability of traditional social insurance mechanisms.
5. **Enhance Local Adaptation to Climate Change**: By generating downscaled forecast information on climate and rangeland biomass for these areas, the project can provide information that can help make communities aware of climate change-related risk and of appropriate, feasible adaptive behaviors. We will do this by generating content for extension messaging by field partners such as CARE. We can also explore whether IBLI might be used as an inducement to encourage uptake of behaviors that can help communities enhance local adaptation to climate change, although the present project would not attempt field piloting of conditional insurance transfers; we would merely due preliminary design work on such instruments.

COLLABORATORS

Australian National University (Canberra, Australia):
Dr. Sommarat Chantarat
BASIX (Jaipur, India):
Mr. Rejeev Gupta (co-principal investigator) and Mr. Satheesh Arjilli
Cornell University (Ithaca, New York, USA):
Prof. Christopher B. Barrett (principal investigator), Ms. Elizabeth Bageant, Mr. Chuan Liao, Jennifer Cissé, Prof. Steve DeGloria, Dr. Brian Dillon, Mr. Teevrat Garg, Mr. Matt Hurst, Mr. Nathan Jensen, Prof. Natalie Mahowald, Ms. Cynthia Mathys, Ms. Sarah Pedersen, Mr. Andrew Pike, Mr. Marc Rockmore, Ms. Asha Sharma, Ms. Megan Sheahan, Ms. Joanna Upton, Prof. Joshua Woodard, Ms. Jenni Zambriski
Institute of Developing Economies (Japan):
Dr. Kazushi Takahashi
International Livestock Research Institute (Nairobi, Kenya):
Dr. Andrew G. Mude (co-principal investigator), Dr. Rupsha Banerjee, Mr. Eddy Chebelyon, Mr. Philemon Chelang'a, Ms. Bryn Davies, Mr. Diba Galgallo, Ms. Anne Gesare, Mr. Wako Gobu , Mr. Duncan Khalai, Dr. Munenobu Ikegami, Mr. Oscar Naibei, Dr. Apurba Shee, Mr. Mohamed Shibia, Mr. Birhanu Taddesse (stationed in Addis Ababa), and Ms. Brenda Wandera Gache
University of Sydney (Australia):
Dr. Russell Toth
USDA-Agricultural Research Service (Boise, Idaho, USA):
Dr. Pat Clark

CAPACITY BUILDING

Student and Post-Doc Training

Several Cornell graduate students have gotten training in data entry and cleaning, working in the field with focus groups and in the herd collaring exercise, as well as codebook construction (Liz Bageant, Jennifer Cissé, Kibrom Hirfrfot Tafere, Nathan Jensen, Chuan Liao, Ellen McCullough, Marc Rockmore, Joanna Upton). A Cornell undergraduate (Andrew Pike) has worked with IBLI and its commercial partners on production of clear financial education and marketing materials. Another Cornell undergraduate student (Casey Goldvale) has worked with our team in comparing HSNP and IBLI household survey data in Kenya. A third Cornell undergraduate student (Chris Mills) has been helping to identify other regions in Africa that have environments and pastoral populations that are suitable for index insurance products. A Kenyan student (Diba Galgallo) has been getting training in field survey methods and project management. One of the previous members of the ILRI research team, Mr. Samuel Mburu, received a scholarship to pursue his PhD with the Food Security Center at Hohenhiem University in Germany in September 2013 and a current member of the team, Mr. Mohamed Shibia has also recently received a similar scholarship for PhD study and will begin his studies at the University of Trier (Germany) in September 2014.

A group of NSF-supported students in the Cornell-run Food Systems and Poverty Reduction IGERT program (Matt Hurst, Nathan Jensen, Sarah Pedersen, Asha Sharma and Jenni Zambriski) undertook a three-week field research project in Borena supported by our project, in which they undertook an inventory and critical assessment of existing climate risk management strategies among the Boren

and the potential complementarity or conflict between IBLI and those pre-existing approaches. Post-docs Brian Dillon and Kazushi Takahashi, grad student Teevrat Garg, assistant professor at the University of Sydney (formally a graduate student at Cornell) Russell Toth, undergraduate Casey Goldvale, and Research Support Specialist Megan Sheahan have been supporting the project in various ways, including survey design and implementation on handheld computers using Surveybe software, as well as data cleaning and documentation. Cornell graduate students Liz Bageant, Nathan Jensen and Chuan Liao have helped with focus group interviews and herd collaring, learning about the store-onboard-only GPS herd collar equipment and various field research methods. Nathan Jensen, Liz Bageant, and Kibrom Hirfrfot also helped field household surveys. In August 2014, following completion of his Ph.D., Nathan Jensen began as a post-doc at Cornell supporting IBLI and broader pastoral development research programs, funded by ILRI.

Partner Training and Capacity Building

The team is has continuously engaged in capacity development efforts across its partners since the program's inception. Capacity development efforts became more systematic in 2013 after donors agreed to a widening of the scope of support the team should provide to its implementation partners. The team organizes and hosts a whole range of partner training and sensitization workshops.

The suite of capacity building efforts includes cross-border learning events such as the exposure visit that CIFA Ethiopia and Trocaire organized for community representatives from Borena to visit Marsabit, and the subsequent reflection workshop was held in Yabello in 2013. The exposure visit aimed at getting an update on IBLI's roll out progress, and looking into the potential for expansion and the challenges from all the organizations involved. It also includes, in Northern Kenya, visits by interested partners (NGOs, insurance companies etc.), to field sites with currently active programs. Before each sale window the ILRI team has a training coordination and planning event in Nairobi and thereafter members of the team provide support to insurance companies and their ground-support partners as they conduct training workshops in program sites for their sales and extension agents. In addition, the team conducts sensitization workshops for county executives and administrators to ensure the political and technical leadership of the counties are aware of the program, understand it, and also to leverage their support.

ACTIVITIES & ACHIEVEMENTS

Previous sales periods were challenged by lack of consumer understanding of the product, as well as lack of trust in the product. As many of the pastoralists had not seen a payout (as the insurance had not triggered), many were waiting to see what happens during a drought to "test" whether or not the insurance works. In fact, many pastoralists reported that while they thought the insurance was good, they preferred to observe the experiences of others before purchasing it themselves. In addition, good weather conditions (especially early rains) reduced the probability of drought in the next dry season, making IBLI seem not worth the investment to observant pastoralists.

Learning from previous challenges, in 2014 the IBLI team increased engagement of partner organizations to hold workshops and trainings to improve understanding of insurance and how it works. The insurance company, Oromia Insurance Company (OIC), also changed sales channels from individuals to cooperatives. The total contracts began to increase, but it became increasingly

apparent that a payout would be needed to build confidence in the product (despite the fact that obviously nobody is hoping for a drought).

In the August/September 2014 and January/February 2015 sales periods, IBLI Ethiopia experienced a substantial sales boost, almost selling in the 5th sales window what it sold in the previous three combined. The number of policies sold in the August/September 2014 sales window reached its maximum to date with 779 policies sold. Researchers believe that this increase is evidence that the product has been gradually gaining acceptance in the community. In January/February 2015 sales dropped slightly with 698 policies sold (likely due to the inaction of one of the partner organizations, or due to the better weather conditions on the ground).

Since the project's inception in January 2012 through May 2015, 2,613 contracts have been sold, providing coverage for 3,064 TIHVs, 2,883 TLUs with a value of $870,000 USD. A payout was triggered in October 2014, and to a lesser extant in March 2015. These were the first times the IBLI Ethiopia contract had triggered payment. This also boosted sales and trust in the product. To date, IBLI Ethiopia has paid out over $30,000 to 523 policyholders.

KEY FINDINGS & LESSONS LEARNED

Among other results, researchers have found that household demand for IBLI is price sensitive, but that in that case of Kenya, there seem to be a number of other factors that influence demand, in particular basis risk, adverse selection and understanding of the product. Interestingly, poor understanding of the product is a key reason Borena households give for not purchasing IBLI, but an exogenous increase in product understanding – induced through randomized extension treatments – does not appear to increase uptake among these households. We find no discernible gender differences in IBLI uptake to date.

Perhaps most importantly, using both the Ethiopia and Kenya data, and different methods, the research team consistently find significant, positive welfare effects of IBLI on households that purchase the insurance. In Ethiopia, estimates are necessarily offer lower bounds on the estimated effect of IBLI since there have been limited indemnity payments to date and thus the product has net negative financial impact on households. We nonetheless find that subjective well-being data reveal a significant positive effect of IBLI, in spite of statistically significant buyer's remorse effects at having purchased a contract that did not pay out. This indicates that, even knowing that they might regret purchasing insurance if it does not pay out, our survey respondents find IBLI welfare enhancing in expectation.

In Ethiopia there has also been some progress in understanding livestock migration patterns, foraging behavior and herding strategies in an effort to better anticipate the impacts of IBLI coverage on rangeland conditions. Most immediately relevant to the IBLI agenda, as Ethiopian households with IBLI coverage improve their understanding of the IBLI product, they increase their herd size and increase their grazing intensity as is evident by a reduction in herding speed and distance. These results are just a first step and substantial further study is needed.

NEXT STEPS

Researchers and partner organizations will continue to refine the product for pastoralists in Ethiopia, despite the fact that BASIS support for the project concluded in May 2015. The IBLI Kenya product now being sold triggers payment to pastoralists to help maintain their livestock in the face of severe forage scarcity; it has evolved from an asset replacement contract to an asset protection product that attempts to pay them in times of drought so that they can purchase water and forage for their livestock before they perish. This revision responds to pastoralists' preferences, and is largely responsible (along with a few other revisions) to a dramatic spoke in sales in Kenya after its introduction. Oromia Insurance Company in Ethiopia has now committed to moving to this asset protection type contract starting in the later period of 2015, with cover commencing October 2015.

In addition, the research and implementation teams continue to be regularly called upon by myriad interested stakeholders – ranging from insurance companies, government agencies, development organizations and others – to give presentations or even conduct trainings on IBLI. Researchers and partners will continue to engage in these activities after the conclusion of BASIS support and as the project continues.

OUTPUTS

Papers:

- Stefano Ermon, Yexiang Xue, Russell Toth, Bistra Dilkina, Richard Bernstein, Patrick Clark, Steve Degloria, Andrew Mude, Christopher Barrett and Carla Gomes, "Learning Large Scale Dynamic Discrete Choice Models of Spatio-Temporal Preferences with Application to Migratory Pastoralism in East Africa," Proceedings of the Twenty-Ninth Conference on Artificial Intelligence, Special Track on Computational Sustainability. (AAAI-15) 2015.
- Elizabeth R. Bageant, Christopher B. Barrett. (2015). "Gender Differences in Demand for Index-based Livestock Insurance"
- Jennifer Cissé and Christopher B. Barrett. (2015). "Does Insurance Improve Resilience? Measuring the Impact of Index-Based Livestock Insurance on Resilience in Northern Kenya."
- Jennifer Cissé and Christopher B. Barrett. (2015). "Resilience Measurement: An Approach to Resilience Identification and Aggregation."

Media Coverage:

- The Beacon Reader: Livestock insurance protects herders against drought. (5 November 2014).
- Economics that Really Matters blog: Index-based insurance: Insurance or lottery tickets? (29 December 2014).
- The Daily Nation: "Animal insurance brightens up pastoralists' lives" (16 January 2015)
- CGIAR Research Program on Climate Change, Agriculture and Food Security: "Agricultural insurance innovations breathe new life into pastoralism in Ethiopia" (January 2015)
- CGIAR Research Program on Climate Change, Agriculture and Food Security: "Scaling up index insurance for smallholder farmers: Recent evidence and insights" (January 2015)
- Cornell Chronicle: Space-age technology points African herders in right direction (18 February 2015)
- Futurity: App Tracks Kenya's Best Places to Graze (20 February 2015)
- Red Orbit: Can smartphones help Kenyan cattle herders? (23 February 2015)
- Development Impact Blog: CSAE 2015: Impact Evaluation Round-up. (26 March 2015)
- National Socio-environmental Synthesis Center: Defining "Resilience" in the Context of

International Development (23 April 2015)

Presentations:

- "Resilience Measurement: An Approach to Resilience Identification and Aggregation," presented by Jennifer Denno Cissé at the 12th Annual Midwest International Economic Development Conference, University of Wisconsin- Madison, April, 2015.
- "Index Insurance and Cash Transfers: A Comparative Analysis from Northern Kenya,"presented by Nathan Jensen at the Annual CSAE meetings, Oxford, England, March, 2015.
- "The Favorable Impact of Index-Based Livestock Insurance (IBLI): Results among Ethiopian and Kenyan Pastoralists," presented by Christopher Barrett, USAID Headquarters, Washington, D.C., February, 2015.
- "Food Security As Resilience: Reconciling Definition and Measurement Empirical Example from Northern Kenya," presented by Joanna Upton at the USDA Economic Research Service Workshop on 'Finding Meaning in Our Measures: Overcoming Challenges to Quantitative Food Security', Washington, D.C., February, 2015.
- "Food Security As Resilience: Reconciling Definition and Measurement," presented by Christopher B. Barrett at the USDA Economic Research Service Workshop on 'Finding Meaning in Our Measures: Overcoming Challenges to Quantitative Food Security', Washington, D.C., February, 2015.
- "How Basis Risk and Spatiotemporal Adverse Selection Influence Demand for Index Insurance: Evidence from Northern Kenya," presented by Nathan Jensen at the Annual NEUDC meetings, Boston, MA, November, 2014.
- "Unpacking Factors behind the (Low) Uptake of Index-Based Insurance: Quasi-Experimental Evidence from Livestock Insurance in Southern Ethiopia," presented by Kazushi Takahashi at the Annual conference of Japanese Economic Association at Seinan Gakuin University, Fukuoka, Japan, October, 2014

A Quasi-Experimental "Post-Mortem" Study of a Discontinued Insurance Product in Haiti

Lead Institution	Columbia University
Principle Investigators	Emily Breza
Country	Haiti
Mechanism Under Investigation	Index Insurance
Timeline	May 2014 – October 2015
Commodity	

Background

Agriculture is the primary source of income in rural areas of Haiti, employing sixty percent of the population. Women who work as small-scale entrepreneurs and transporters – known as "Madam Saras" – interact with more than ninety percent of all domestic crops, forming the backbone of the agricultural value chain and its information network. These entrepreneurs face significant uninsured risk due to extreme weather events, reducing asset accumulation and investment in high return, but risky, activities. Because of the central role of Madam Saras as a transport and information network, financial and informational products that offer protection against weather-related risk to this key segment of the agricultural value chain have the potential to positively impact the entire sector.

In January 2011, Fonkoze, the largest microfinance institution in Haiti, began jointly addressing missing credit and insurance markets by simultaneously providing weather index insurance along with credit to 60,000 borrowers. A significant portion of these borrowers was made up of Madam Saras, and 80 percent belong to households that engage in agricultural activities. Following the 2010 earthquake, Fonkoze instituted a mandatory natural disaster insurance policy covering its 60,000 female borrowers. The product was designed to reduce Fonkoze's portfolio risk to natural disasters while supporting borrower advancement. The hybrid index- and indemnity-based policy covered the institution (Fonkoze) against rainfall, wind and seismic shocks based on sharp parametric thresholds, and protected the property of all 60,000 borrowers through indemnity-based coverage. An important innovation in product design was training one peer-elected borrower per credit center to process and verify their peer's claims during credit meetings, thereby leveraging Fonkoze's machinery for scalable, low cost loss adjustment using village-level, private information (with backup from staff auditing teams). However, in attempting to insure the property of its borrowers, the payouts from the index-based arm of the product did not match those from the indemnity-based arm of the product, eventually bankrupting the policy. As a consequence, the indemnity-based component of the insurance policy covering borrowers was unexpectedly discontinued in late October 2012, while the index-based component covering the institution continues.

Summary

The Fonkoze insurance product, while no longer operational, provides a unique learning opportunity to investigate the failure of the integrated credit-hybrid insurance product retrospectively by conducting a "post-mortem" investigation. Researchers aim to conduct a quasi-experimental study of the discontinued product using a variety of identification

strategies and data sources, including new survey data, administrative banking data, cellular carrier and remittance data, and prior survey data.

Researchers plan to focus on two sources of problems that are potentially interrelated: basis risk in the parametric-based insurance arm and moral hazard in the peer loss adjustment- and indemnity-based insurance arm. Because flooding risk is particularly complex to model physically, using parametric indices to insure against hurricane or rainfall-related property damage is challenging. Even conditional on a well-designed index based on granular, real-time weather data in developed country settings, significant idiosyncratic variation in damages to property due to flooding and extreme rainfall means that index insurance policies will retain large basis risk; and all the more so in mountainous, degraded topographies with sparse weather sensors and high variation in the slope of land. Indeed, the payouts from the parametric-based arm of the product did not match those from the indemnity-based arm of the product, alternately overshooting or undershooting by more than fifty percent and eventually making the policy unsustainable. At the same time, the proportion of verified claims was much higher than anticipated ex-ante, suggesting undue leniency in peer auditing, with borrowers commonly reporting preventable damages, implicating moral hazard.

Researchers will examine what went wrong with the product and why, in order to generate recommendations for possible improved models.

Collaborators and Partners

Columbia University
Emily Breza, PhD Assistant Professor, Graduate School of Business Columbia University
*Aaron Baum,*PhD Candidate School of International and Public Affairs Columbia University
Daniel Osgood, Lead Scientist, Financial Instruments Sector Team, Associate Research Scientist in Economic Modeling and Climate, International Research Institute for Climate and Society

Quisqueya University and State University of Haiti
Benedique Paul, Professor, Economics Department

Fonkoze
Carine Roenen, Executive Director

Timothy Schwartz Consulting, LLC
*Timothy Schwartz,*President

Activities and Achievements

In this reporting cycle researchers were able to follow through on six major accomplishments.

1. Acquired and analyzed set of administrative data from Fonkoze and partners including poverty scorecard panel data, loans and savings data administrative records, insurance program administrative records and insurance policy qualitative information.

2. Began quantitative analyses of merged data. Results from this preliminary analysis are extremely early-stage, but there appears to evidence that suggest individuals who received greater loan-forgiveness are ~1.5x more likely to continue borrowing two and three years later, potentially due to reduced likelihood of defaulting on subsequent loans. Researchers also see that individuals who did not receive any direct benefit from the insurance (e.g. did not make any claims for benefits or whose claims were rejected for not meeting criteria for approval), but who are in joint liability groups with individuals that received greater benefit from the insurance, may also be more likely to continue borrowing two and three years later due to indirect benefits/spillover effects.
3. Matched GIS meteorological data to the administrative data
4. Survey creation, testing and administration
5. Held discussions with key people involved in project (PIs, consultants, partners); regular team meetings over Skype meeting with PIs and weekly/as needed meetings with support staff. Researchers anticipate meeting with USAID stakeholders in Haiti on the next field trip.
6. Obtained Columbia University approval of all Haiti vendors; and remitted payment to vendors.

All established benchmarks for this reporting cycle were met.

Capacity Building

In-country capacity building included training of implementation partners in M&E, primarily survey administration and how to utilize mobile data collection tools for surveys (ODK, a free and open-source set of tools which help organizations author, field, and manage mobile data collection solutions). The focus was walking through how to create a Progress Out of Poverty and Food Security Survey using ODK.
In addition, a PhD student, Aaron Baum is being trained through close involvement with this project. He worked to co-develop the research question, quasi-experimental identification strategy and design and led project management and coordination along with multiple partners.

Outputs

Due to the early stage of this project, there have been no presentations or publications to date. Researchers anticipate that in the next reporting cycle outreach and dissemination will begin.

Net Steps

The main activities to be conducted in the next reporting cycle, ending December 2016, include completing the survey administration across several regions of rural Haiti to approximately 2,000 microfinance borrowers who were (differentially) affected by the microfinance institution's (now discontinued) insurance policy; to link the final survey dataset to the administrative data to be analyzed; and to finalize deliverables and outputs for dissemination (via papers, presentations, and stakeholder meetings). All activities relating to this research project should be completed in this next year, culminating with a finalized policy paper, policy dissemination meetings and seminar presentations in Haiti and at Columbia University.

FEASIBIITY STUDY ON AGRICULTURAL INDEX INSURANCE IN NEPAL

Lead Institution	University of California Davis
Principle Investigators	Michael Carter
Country	Nepal
Mechanism Under Investigation	Index Insurance
Timeline	April 2014 – September 2015
Commodity	Rice and/or maize (to be determined)

BACKGROUND

Farming by nature is a risky activity. The main source of risk in developing countries is often yield uncertainty: farmers cannot perfectly predict their yield at the time they plant because of variations in weather. Such risk is known to have dual negative impacts:

- **Ex-post effect**: if a disaster happens, uninsured farmers often have to sell assets in order to repay debts and smooth consumption pushing them into destitution. Insurance helps farmers cope with such disasters and prevents them from falling into a level of destitution from which it is difficult to recover (a poverty trap).
- **Ex-ante effect**: when risk-averse farmers perceive their activity as risky, they often choose to underinvest in new "risky" business opportunities in order to avoid risk, often at the cost of higher expected returns. By reducing risk, insurance can encourage investment, increasing the demand for credit, and improve access to finance because lenders have a guaranty that farmers can repay loans when a disaster occurs. These investments can help increase yield and reduce poverty.

Despite the potential for both ex ante and ex post impacts of insurance, insurance markets remain underdeveloped in developing countries, including Nepal. One of the most important factors explaining the absence of insurance markets in developing countries is the prohibitive cost of insurance: poor farmers cannot afford to pay the premium for an insurance product where experts have to visit each field and assess losses each time the farmer claims an indemnity. This adjustment process can add significantly to the cost of insurance.

Covariate shocks and index insurance

At the same time, many of the predominant risks to agriculture are shared by many farmers in a region at the same time – drought and floods, for example – generally impact many people in the same geographic area at the same time. Index insurance is an innovative alternative that is designed to deal with precisely these types of covariate, or shared, risks.

PROJECT SUMMARY

Index insurance has the potential to address the problems of uninsured covariate risk in Nepal. Index insurance reduces the administrative costs since the adjustment process is not used to determine payment. Instead of measuring individual losses field by field, an objective data set that is highly correlated with individual yield is chosen as the index (for example, the average yield in a village) and indemnities are paid when this index triggers a

pre-defined threshold. The quality of the correlation between the index and individual yield is absolutely crucial to the success of any index insurance program.

This type of insurance product is designed to make insurance affordable to a larger number of farmer at a lower cost (because experts' field visit are not required) at the expense of basis risk, which is the difference between individual farmers' losses and what the index predicts. Since payments are based on the index rather than individual experience, it is critical to select the best index and ensure that the insurance contract is designed in such a way to minimize basis risk. There are a number of basic options that can be considered.

BASIS researchers will assess the potential for index insurance in Nepal across agricultural production sectors and across different indices to see if there is a feasible solution to help farmers in Nepal manage risk for greater resilience and movement toward agricultural growth opportunities.

RESEARCH QUESTIONS & INTENDED IMPACTS

The objective of the feasibility study is twofold: researchers will

1. Determine where (which activities/regions/etc.) the development impacts of insurance-based risk management strategies would be maximized; and,
2. Assess whether there is appropriate and available data that is correlated with the identified agricultural outcomes (based on identified activities/regions/etc.) such that it can be used to create an effective index for an insurance product.

Our goal is to identify geographic areas and commodities that have both high potential for significant development impacts, as well as areas where there is data that can be effectively used to predict farmer outcomes and design an effective index insurance contract.

CURRENT ACTIVITIES & ACHIEVEMENTS

The objective of the first stage of this study was to determine where (which activities/regions/etc.) the development impacts of insurance-based risk management strategies would be maximized and where there is enough data available to develop a product. In particular, researchers investigated:

1. ***the existing agricultural insurance programs in Nepal.***
   Researchers found that given the existing livestock insurance schemes offered to farmers and their adequacy in meeting farmers' needs, the next stage of work should focus on crop insurance, which remains underdeveloped in Nepal.
2. ***the extent to which production risk impacts farmers' ability to generate higher incomes.***
   Weather and disease are important factors limiting crop farmers' access to credit and capacity to invest in new technologies. In particular, rice farmers are highly dependent on the timing and intensity of the monsoon, winter maize yield is very sensitive to cold temperatures and vegetable farmers can experience diseases and hailstorms that impact production.

3. ***the existence of appropriate technologies to mitigate these risks and generate higher incomes.***
   Cereal crops (rice and maize) could strongly benefit from the adoption of hybrid seeds while vegetable farmers may benefit from investments on their land (seeds, irrigation, plastic sheets, etc.).
4. ***the availability of historical yield data and the consequences for index design.***
   We found that yield data are very scarce in Nepal. But remote-sensing solutions for cereal crops yield prediction could be a solution to data scarcity; while administrative and survey data are not enough for the development for area-yield indices, they could allow us to calibrate a satellite-based index. Furthermore, the organization of vegetable farmers around collection centers might give us the opportunity to build index insurance for vegetables.

The analysis conducted during the first stage of this project led BASIS/I4 to choose rice as the most promising crop for the development of an index insurance product in Nepal. Indeed, other crops (winter crops in general, and maize in particular) would require some very sophisticated remote sensing techniques that do not appear to be fully developed yet.

In order to perform a detailed analysis of the potential for an index insurance product for rice farmers in Nepal, BASIS/I4 organized a survey of farmers in the areas under investigation. This survey, conducted in March 2015, consisted in the collection of recall yield data with a particular attention to the losses experienced during very bad years during the last fifteen years. Though very noisy, these data are almost the only source of information available to calibrate a satellite index in Nepal.

Because there exists no real time source of yield data for rice production in Nepal, an area yield index is infeasible. The only option for index insurance, then, is to use an indirect approach based on weather indices (rainfall, temperature, wind, etc.) and/or vegetation indices (NDVI, Gross Primary Production, etc.). BASIS/I4's experience with weather indices and the large number of climatic events impacting rice yields led the team to focus its efforts on remotely sensed vegetation indices that have been promoted as the best candidates when area yield data are not available.

The adaptation of the remote sensing techniques that were previously applied to rice cropping in Tanzania to the case of Nepal has proven to be very challenging in part because of the thick cloud cover that characterizes the rice season in Nepal. Our initial look at the remote sensing data showed unrealistically large variation in several indices that appeared to be due to a lot of missing observations during the monsoon seasons.

These missing observations issues have been controlled for now, and the BASIS/I4 team has performed several test of correlation between the remotely sensed vegetation indices and the historical yield data collected in the field. Unfortunately, the empirical results obtained so far do not show any sign of a link between remotely sensed vegetation indices and yield data, which indicates that index insurance may be infeasible in Nepal under current circumstances.

COLLABORATORS

Collaborator:

Thomas Barre, Post-Doctoral Fellow, I4 Index Insurance Innovation Initiative, University of California Davis

Sudhindra Sharma, Interdisciplinary Analysts (IDA), Nepal

In conducting an assessment of the feasibility of an index insurance product in Nepal, the BASIS team consulted numerous researchers and potential collaborators, including experts in various agriculture and horticultural activities, government agencies, and insurers/financial institutions.

CAPACITY BUILDING

Work on this project was conducted with the assistance of a graduate student who volunteered his time on the project, Jisang Yu. Work on this project has given him direct field experience conducting the retrospective yield survey, as well as experience in the analyzing the potential use of satellite technology or area yield information to develop index insurance.

OUTPUTS

1. "Field trip report – Agricultural Insurance in Nepal". BASIS/I4. June 2014.
2. "USAID Agricultural Index Insurance in Nepal: Phase 1 Final Report". BASIS/I4. August 2014.

NEXT STEPS

We have now explored all of the available options that we might consider for an effective and feasible index insurance design in Nepal, and the results are not promising. There are a handful of options that the research team is still exploring, however they may conclude that a risk management instrument like index insurance may not be feasible in Npeal given current technological constraints.

Tweak the index design.
Some additional tests remain to be done before we can definitively abandon the idea of a satellite-based index insurance product for rice in Nepal. In particular, the BASIS/I4 team intends to re-analyze the data using smaller scale satellite data. Some additional indices that did not perform well in the case of Tanzania will also be investigated in case they would capture ground conditions better in Nepal.

Consider innovative contract design options.
If this correlation challenge can be overcome, the BASIS/I4 team will conduct an analysis of contract design options. Ideally, researchers would be able to develop a contract that has very low basis risk if they have identified data that is very accurate in its predictions of farmer outcomes. It is possible, however, that for the most promising development impact areas and activities, index insurance can only capture a moderate share of risk, so that basis risk is medium. If such a case arises, index insurance could be backed-up by some

mechanism that reduces basis risk by giving farmers another opportunity to be compensated for losses that were not predicted by the satellite data. One example of such a mechanism would be to allow farmers to petition for a crop cutting exercise when the index does not accurately capture a significant loss. When the petition receives enough signatures, an expert is sent to the area where he analyzes some fields picked at random. He can then decide that indemnities should be paid or not to farmers. This adds a layer of protection for the farmers from experiencing significant losses that are not predicted by the index's data.

Consider a rainfall-based index.
Our preliminary analysis for the potential of a rainfall-based insurance product indicated that such a product is likely infeasible in this environment, both because of large distances between weather stations and the poor correlation between rainfall measured at weather stations and the experience of farmers even a relatively modest distance away from the closest weather stations.

Consider an area yield contract.
Preliminary analyses indicate that at least roughly 39 percent of losses experienced by farmers were covariate shocks. Because of this, there is potential for a moderately effective insurance contract using area yield. Average area yield would clearly be highly correlated with individual farmer losses and therefore have high predictive power, but the data needed for such a contract could be prohibitively costly to collect. Though this yield data is not currently collected, this kind of data collection for risk management instruments could be donor supported as part of a development agenda. This public support of the necessary data could make an area yield contract financially feasible.

Conclude an effective index insurance contract is not feasible under current circumstances.
It is possible that, for this given situation with currently available technologies, there are no available solutions to create an index insurance product that has the potential for development impact and responsibly protects farmers against risk. Moving forward with an irresponsible product that does not accurately predict farmer losses could be catastrophic, both for the individual farmers who purchase such an insurance product and for the long-term insurance market prospects in the country.

In consultation with USAID mission in Nepal, we are determining the next steps for this project.

PROMOTING ADOPTION OF IMPROVED PRODUCTION TECHNOLOGIES AMONG SMALLHOLDERS IN GHANA VIA COUPLED CREDIT AND INDEX INSURANCE CONTRACTS

Lead Institution	The Ohio State University
Principle Investigator	Mario Miranda
Country	Ghana
Mechanism Under Investigation	Coupled Credit and Index Insurance
Timeline	1 August 2013 – 31 August 2016
Commodity	Maize

BACKGROUND

Index insurance, while promising, has often produced disappointing results in many developing countries in which it has been implemented. Index insurance, which covers the policyholder based on an external index such as rainfall or other weather-related measures rather than individual losses, has the potential to improve the lives of farmers in the developing world by allowing them to manage the risks of droughts, floods, or other natural disasters. However, skepticism has been growing regarding the benefit of index insurance sold directly to farmers. Many index insurance studies have found that significant uptake only occurs when it is heavily subsidized or coupled with low-interest loans, with demand disappearing as soon as the subsidy is eliminated. Index insurance has proven especially ineffective when borrowers can easily default on loan repayments without suffering major consequences such as loss of collateral. When widespread default occurs due to a natural disaster, lenders suffer along with the farmers.

In such situations it is clear that the farmer, the insurer, and the lender are undeniably linked. If insured farmers experience widespread drought, the insurer experiences heavy losses and consequently demands higher insurance rates than most smallholder farmers in a developing country can afford. If farmers cannot afford the insurance, they will not buy it. Without insurance, they are reluctant to take on the additional risk of a loan and are thus unable to afford to adopt new technologies that would allow them to increase their income. Lenders who experience widespread loan defaults due to recurring droughts, floods, and other adverse systemic natural events reduce the availability of agricultural credit and either raise the interest rates for agricultural production loans or engage in more restrictive non-interest credit rationing. Researchers are hoping to break one part of this vicious cycle by introducing a new type of loan product.

PROJECT SUMMARY

Recent research suggests that smallholder access to agricultural credit can be dramatically increased if they payout goes directly to the lender, rather than to the farmer. This would work similarly to car insurance in the United States, in which auto lenders require the purchase of insurance before the car is driven off the lot as a condition for a car loan. For farmers in developing countries, this contingent credit contract would be a new type of agricultural loan product. For smallholder farmers using this product, in the event of a drought or other insured event, the amount of the loan the farmers are required to repay to the lender is reduced (if not eliminated) since the outstanding balance is automatically covered by the insurance payout received by the lender.

When index insurance is integrated into lenders' credit portfolios and loan policies, the incentives for strategic default by smallholders are curtailed, substantially reducing the negative impacts of widespread loan defaults on lenders due to an extreme weather event. By managing systemic risk due to widespread weather shocks using index insurance, the lender should be able to provide more loans to smallholders at lower interest rates.

To support the use of agricultural credit using index insurance, The Ohio State University (OSU) and the African Center for Economic Transformation (ACET), in collaboration with the University of Ghana, are undertaking a program of research, outreach and education. The research team is working closely with the Ghana Agricultural Insurance Programme (GAIP) to test the hypotheses that contingent credit backed by index insurance will reduce the impact of widespread agricultural loan defaults on lenders during adverse systematic natural events.

RESEARCH QUESTIONS & INTENDED IMPACTS

This research project will evaluate the impact of index-insurance-contingent loans on:

1. The incidence of loan defaults and of losses from default during droughts and other systemic events that reduce aggregate yields;
2. The adoption of higher yielding agricultural technologies among smallholders;
3. Loan provision terms (interest rates and loan amount) offered by lenders to smallholders; and,
4. An expansion of rural lender portfolios, including provision of loans to customers who historically did not qualify.

The GAIP project, which is currently expanding, provides an exceptional opportunity for such an evaluation. Clients would be randomly assigned to one of three groups:

1. Control: No index insurance. Smallholders are offered conventional loans, but not index insurance, and lenders do not purchase index insurance to manage their systemic weather risks directly.
2. Treatment 1: Loans are offered along with mandatory index insurance, with the indemnities assigned to the smallholder.
3. Treatment 2: Loans are offered along with mandatory index insurance, with the indemnities assigned to the lender (the borrower will be informed at the time the loan is made that an index insurance contract will be attached to the loan, and that any indemnity provided by the insurance contract will be paid directly to the lender for the purposes of retiring an equal portion of the borrower's debt; if and when an indemnity is paid, the lender will be required to notify the borrower that an indemnity has been paid and inform him or her of the reduced remaining balance on the borrower's debt obligation).

Lessons learned from this study will inform policymakers throughout the developing world about the potential for index insurance to promote economic transformation of the agricultural sector. The project will work closely with GAIP and the University of Ghana to implement an aggressive outreach and education program to raise public awareness about the use of contingent-credit index insurance. Through these efforts, the project expects to have significant impact on building a sustainable agricultural insurance system and enhancing the performance of the agricultural credit system to the benefit of both farmer and lender.

COLLABORATORS

Co-Principal Investigators
Abdoul Sam, PhD, Associate Professor, The Ohio State University
Nicholas Depetris Chauvin, PhD, Senior Advisor, African Center for Economic Transformation (ACET)
Francis M. Mulangu, PhD, Agricultural Economist, African Center for Economic Transformation (ACET)

CAPACITY BUILDING

OSU/ACET Lead-PI Mario Miranda taught a two-week course in Quantitative Methods for Policy Analysis in the University of Ghana (UofG) PhD program in Applied Agricultural Economics and Policy. The course involved 40 hours of contact and attracted 16 doctoral students and faculty. Project PIs Mario Miranda and Francis Mulangu supervised Francis Kemeze, PhD candidate in Agricultural Economics and Agribusiness at the University of Ghana. Mr. Kemeze completed an an internship with the African Center for Economic Transformation, where he worked on project-related research. Mr. Kemeze also developed a doctoral dissertation that included calling for research on topics related to the OSU/ACET Project. Mr. Kemeze applied for and was awarded a Norman E. Borlaug Leadership Enhancement in Agriculture Program (LEAP) Fellowship, which will allow him to visit Ohio State University for four months during the 2015-16 academic year to conduct project-related research with OSU Co-PIs Miranda and Sam.

ACTIVITIES & ACHIEVEMENTS

Major OSU/ACET activities over the reporting year included the conduct of a baseline survey in March 2015 and the first of two controlled field trials May-October 2015. More specifically, OSU/ACET activities over the reporting year included:

- An OSU-ACET team conducted enumerator training between February 9 and February 15. Field surveys were administered throughout northern Ghana between February 20 and March 17. A total of 779 farmers belonging to 258 farmer groups in the three northern regions of Ghana were surveyed.
- During the reporting period, Project Graduate Associates Tony Gallenstein and Khushbu Mishra, under supervision by Project Co-Principal Investigator Abdoul Sam, organized, validated, and analysed data collected during the baseline survey. The analysis, however, is limited to that which was necessary to conduct the randomization.
- The first controlled field trial, which involved the distribution of loans to smallholders assigned to three experimental groups with different index insurance applications, was initiated in April 2015. In implementing the first controlled field trial, we encountered some unanticipated delays in the loan application and approval process, but this had no impact on the integrity of the randomized control design.

NEXT STEPS

During the 2015-2016 planning year, the Project will undertake seven major sets of activities, which require two visits by OSU research teams in February and September of 2016:

Midline Survey
February 2016: Lead PI Miranda, Project GRA Gallenstein, and Project GRA Mishra will travel to Ghana and, in collaboration with Co-PI Mulangu and Project Manager Cyriaano, administer a midline survey to the farmers who were subjects of the first or our two planned experimental field trials. Protocols for the administration of the midline survey will be developed in November, 2015.

Second Field Trial
April-September 2016: Co-Pi Mulangu and Project Manager Cyriaano, working with GAIP and participating ARB member banks, will implement the second of our two planned experimental field trials. The field trial will involve the extension of agricultural loans to participating subjects to include index insurance contracts offered by GAIP in various combinations, as called for in our original experimental design.

Endline Survey
September 2016: The OSU based research team will travel to Ghana and, in collaboration with Co-PI Mulangu and Project Manager Cyriaano, administer the endline survey to the farmers who were subjects of the second of our two planned experimental field trials. Protocols for the administration of the endline survey will be developed in March, 2016.

Lender Outreach Activities
February 2016: Lead-PI Miranda, Co-PI Mulangu, and Project GA Gallenstein will conduct a series of full-day focus group and SWOT analysis activities with GAIP and ARB managers and decision makers. The purpose of these activities is to obtain feedback from managers regarding their perceived impact of inclusion of index insurance in their credit policies and to explore ways in which index insurance might be incorporated into credit policies in the future.

Educational Outreach Activities
February 2016: Co-PI Miranda will teach a two-week short-course in risk management and impact evaluation methods for students enrolled in the University of Ghana's PhD program in Applied Agricultural Economics and Policy.

October 2015 – January 2016: Lead-PI Miranda will continue to mentor University of Ghana PhD student Francis Kemeze, who will visit the Ohio State University supported by funding by the Norman E. Borlaug Leadership Enhancement in Agriculture Program (LEAP) Fellowship. During his visit, Kemeze will continue to work with the OSU research team to develop plans for the second experimental field trial, the midline survey, and the endline survey, and will continue to work on his doctoral dissertation, a major portion of which is devoted to issues related to Project objectives.

Project Graduate Research Associate Doctoral Dissertations
October 2015 – September 2016: Project GRA Gallenstein will complete his doctoral dissertation under the supervision of Project co-PIs Mario Miranda and Abdoul Sam, to include two essays that are directly related to the Project. Project GRA Mishra will complete her doctoral dissertation under the supervision of Project co-PIs Mario Miranda and Abdoul Sam, to include one essay directly related to the Project: "Does Availability of Index-Based Rainfall Insurance Impact Technology Adoption and How Does It Differ across Gender? Evidence from Ghana".

Peer-Reviewed Journal Manuscripts and Presentations at Professional Meetings
Scientific Project personnel will collaborate on the writing of at least two manuscripts for submission to peer-reviewed scholarly journals that document the scientific findings obtained from our two experimental field trials and associated outreach activities. Scientific Project personnel are also expected to make presentations as scholarly professional meetings, to include, but not be limited to, Meetings of the Applied and Agricultural Economics Association.

OUTPUTS

Given that first experimental treatment has not yet concluded as of the writing of this report, tangible outputs generated by the project have been limited. In particular, no manuscripts have been submitted for publication in scholarly journals. However, the OSU/ACET team has produced some working papers and has made various presentations during the reporting year, including:

- OSU-ACET Project Staff Report: "Baseline Survey Preliminary Report".
- OSU-ACET Project Staff Report: "First Intervention – Timeline and Protocols".
- Lecture Notes: Miranda, "Quantitative Methods for Policy Analysis", presented to University of Ghana (UofG) PhD program in Applied Agricultural Economics and Policy.
- Presentation: Miranda, "Agricultural Index Insurance and Credit in Africa: Lessons Learned and Ways Forward" at the Conference of Climate Change and Multi-Dimensional Sustainability in African Agriculture, Morogoro, Tanzania, June 3-5, 2015.
- Presentation and Working Paper: Project GAs Gallenstein and Mishra and Co-PIs Miranda and Sam, "Willingness to Pay for Rainfall Index Insurance Backed Loans and Basis Risk in Northern Ghana", Annual Meeting of the Agricultural and Applied Economics Association, San Francisco, CA, July 26-28, 2015.
- Presentation: Miranda, "Agricultural Index Insurance in Africa – Lessons Learned and Ways Forward", United Nations Food and Agriculture Organization (FAO), August 3-4, 2015.
- Working Paper: Gallenstein, "Willingness to Pay for Insured Loans and the Impact of Experience in Ghana".
- Working Paper: Gallenstein, "Impacts of Meso Level Index Based Rainfall Insurance on Credit Market Access of Smallholder Farmers in Northern Ghana".
- Working Paper: Mishra, "Does Availability of Index-Based Rainfall Insurance Impact Technology Adoption and How Does It Differ across Gender? Evidence from Ghana".

Selling Formal Insurance to the Informally Insured

Lead Institution	Yale University
Principle Investigator	Mushfiq Mobarak
Country	India
Mechanism Under Investigation	Index Insurance
Timeline	1 March 2013 – 31 March 2015
Commodity	Not crop specific

Background

Nearly three-fourths of the 1.3 billion people worldwide living on less than a dollar a day depend on agriculture for their livelihood. Agriculture is inherently prone to natural shocks; some estimates indicate that in India, about ninety percent of variation in crop production is caused by changes in rainfall levels. Low-income farmers in areas of high agricultural risk tend to invest in assets that are less sensitive to variation, but are also less profitable. This exacerbates pre-existing wealth inequality (as wealthier farmers are more able to make profitable investments), and reduces the possibilities for growth.

Despite the clear negative impacts of risk exposure, ninety percent of the Indian population is not covered by any kind of formal insurance. The government of India has recently begun promoting index-based weather insurance as a way of mitigating the economic impacts of unpredictable monsoons and climate change, yet, despite this strong government support, take-up rates for index-based insurance products have been surprisingly low.

In rural India, however, a system of informal mutual insurance has historically formed around the sub-caste system, called jati. Consumption within a jati can be smoothed via a simple mutual insurance arrangement with limited commitment. Households that receive a negative income shock receive financial support from relatives and other members of their jati who have fairly accurate and easily verifiable information about particular income shocks.

Project Summary

This research project seeks to understand why Indian farmers exposed to weather-based risk may be reluctant to purchase formal insurance products that mitigate these agricultural risks. Further, this study seeks to add to the literature on the market for insurance products by generating rigorous evidence on the relationships between informal risk sharing and the demand for formal insurance.

The insurance policy that will be offered in this study is a “Delayed Monsoon Onset” index-based insurance product, which insures against agricultural losses due to delayed rainfall during the summer monsoon season. First, research partner, Agricultural Insurance Company of India, LTD (AICI) will define an expected onset date of the summer monsoon using historic rainfall data. The onset date is considered delayed if the target amount of rainfall is not reached by one of three pre-selected “trigger” or payout dates. The insurance policy will not be crop specific, thus providing broad coverage for monsoon onset. In addition, since a large share of the sample is comprised of landless agricultural laborers, purchasing units will be independent of the land holdings of the buyer.

This study is the first to empirically explore how informal risk sharing affects the provision of and demand for formal insurance. Researchers make randomized offers of a formal index insurance product to agrarian households. Researchers will track a variety of spillover effects, and study the complex relationships between informal risk sharing and formal insurance markets. For example, one research question to be investigated is: does an insurance purchase have spillover effects on members of the same jati who do not have insurance? The finding of spillovers is important because it suggests not only that insurance take-up is a group decision, with implications for marketing, but also that there may be lower take-up than is optimal because of free riding.

In addition to rainfall-based index insurance, the research team will also examine seasonal migration as another strategy used by households to manage risk. By introducing these very different risk management products to rural households, the research team can ask and answer interesting and novel questions about the complementarities, substitutions, and interactions between index-based rainfall insurance and other forms of risk management. Specifically, the research team will provide small financial incentives (equivalent to covering the round-trip costs to the migration destination) to encourage temporary migration for work during the off-season (after harvest) when local labor market opportunities are scarce.

Current Activities and Achievements

In this reporting period a second round of interventions were rolled out. All cultivators who were offered insurance in the previous round and a random subset of landless laborers were again offered insurance. Half the landless laborers in each group - Cash, Migration and Control, were randomly selected to receive an insurance offer. It is vital to note at this point, that the insurance marketed in both rounds provides a cover for the same Kharif 2014 season. Researchers want to understand the impact of the temporal proximity of marketing insurance to the monsoon, on the take-up of rainfall insurance. Further, half of all respondents who were marketed insurance were randomly selected to be given a marketing script that described the Indian Meteorological Department's (IMD) forecast for the coming monsoon season. The other half was marketed insurance without the additional information regarding monsoon forecasts.

In both rounds, a second visit was made by the marketer to *all* respondents, a day or two after the marketing script and short survey were administered. This intervention was based on the thinking that households might not be able to come up with enough money to buy the insurance units at very short notice and might require some time to think it over and perhaps discuss it with a trusted friend or advisor.

While researchers were finishing up surveys and treatments in Tamil Nadu, they simultaneously began to prepare the follow-up survey to which was to be administered in all three states starting January 2015. Training and began data collection in late January in both Andhra Pradesh and Uttar Pradesh and finished by the third week of March. In Tamil Nadu, researchers began in mid-February and wrapped up field operations in the first week of April. The next few weeks were spent cleaning the large volume of data collected. The central task currently underway is the lengthy process of analyzing and interpreting all of the collected data.

Some preliminary findings about the determinants to take-up of index-based rainfall insurance have emerged to explore further once all of the data has ben analyzed. For example, one interesting discovery is that the take-up rate increases after if farmers are offered insurance more than once with a several month interval in between offers. This suggests the second or third visits are crucial

as they allow households to consider carefully and discuss what has been proposed to them and then gather enough money to pay the insurance premiums

Collaborators

Co-Principal Investigators

- *Mark Rosenzweig*, Department of Economics, Yale University

Collaborating Institutions

- Agriculture Insurance Company of India
  AICI continues to be the primary partner for this research. AICI's large operating scope and capacity throughout India, as well as its willingness to custom-tailor insurance contracts (as they have demonstrated by developing a new product for our research project) will ensure that the lessons learn will have direct and relevant effects on the agricultural insurance market and products they offer. AICI local offices and marketing affiliates (with whom researchers now have an established relationship) will provide wider network to disseminate our results and lessons learnt.

- Center for Microfinance (CMF), Institute for Financial Management and Research (IFMR*)*
  IFMR is an India-based independent research organization that focuses on issues related to financial access for the poor. The research team developed a partnership with CMF in late 2009 to implement the project. CMF teams have developed tremendous field research capacity in the process, as well as a strong relationship with AICI.

Capacity Building

For follow-up data collection in each of the three states contained in the research area, a team of enumerators was trained for a period of ten to twelve days each. They were first trained in great detail on every question in the survey and on etiquette to be followed while conducting field surveys. This was followed by extensive training on how to conduct surveys using netbooks including an in-field practice session along with detailed feedback and debriefing. Training for Andhra Pradesh took place in Hyderabad, while the Uttar Pradesh and Tamil Nadu teams were trained in Lucknow and Chennai, respectively.

Outputs

A BASIS Brief was published in January 2015 titled, *The Interactions Between Formal Insurance Markets and Informal Risk Sharing in India*, by A. Mushfiq Mobarak, Kolli Rao and Mark Rosenzweig

Data collection, cleaning and preliminary analysis is ongoing and working papers and presentations are being developed for dissemination in the next reporting cycle.

Next steps

Now that the data collection and cleaning is nearing completion and the analysis and interpretation phase has begun, the research team is excited about the emerging results and contingent impacts to understanding the determinants to take-up of index insurance in particular in areas where informal insurance already exists. In the next reporting cycle, the policy implications of this research will be revealed and the main culminating research paper and related presentations should be available.

RESEARCH THEME B: FINANCIAL MECHANISMS FOR THE ADOPTION OF IMPROVED TECHNOLOGIES

In much of the developing world, productivity continues to fall short of potential, in part due to low adoption of productive agricultural technologies that could improve yields, such as improved seeds or fertilizer. As a result, many smallholder farmers remain mired in poverty and do not take advantage of potentially profitable opportunities. Providing an avenue of upward mobility to small-scale farmers requires overcoming the barriers that prevent farmers from making the investments necessary to experience a jump in productivity and income.

While a broad consensus agrees that small-scale farmers face many prospective barriers to technology adoption, there is limited rigorous evidence on the relative effects of these constraints on technology adoption, and on the impact of financial technologies designed to address these barriers. The BASIS Assets and Market Access Research Program has assembled a portfolio of projects designed to generate critical knowledge around both the barriers to technology adoption that constrain small-scale farmers and potential solutions. BASIS is particularly interested in interventions that emphasize investigation of potential complementarities between financial and agronomic technologies, and to thoroughly evaluate these instruments for development impacts.

Projects Under Theme B

- *Evaluating the Socio-Economic Impact of Western Seed's Hybrid Maize Program in Kenya*
  Michael Carter, University of California Davis
- *Demand and Supply Constraints to Improved Sorghum Technology Adoption and their Gender-Differentiated Effects in Burkina Faso*
  Andrew Dillon, Michigan State University
- *Household-Level Impacts of System of Rice Intensification (SRI) in Haiti: An SRI Intervention with Training, Insured Credit, and Coordination by Irrigation Bloc*
  Travis Lybbert, University of California Davis
- *A Multiple Interventions Approach to Increasing Technology Adoption with a View Towards Scaling Up: Evidence from Mexico*
  Aprajit Mahajan, University of California Los Angeles
- *Evaluating the effect of site-specific soil information on farmer input choices and the relationship between poverty and soil quality in Tanzania*
  Cheryl Palm, Columbia University
- *Complementarities of Training, Technology, and Credit in Smallholder Agriculture: Impact, Sustainability, and Policy for Scaling Up in Senegal and Uganda*
  Stephen Smith, George Washington University

EVALUATING THE SOCIO-ECONOMIC IMPACTS OF WESTERN SEED'S HYBRID MAIZE PROGRAM

Lead Institution	University of California, Davis
Principle Investigator	Michael Carter
Country	Kenya
Mechanism Under Investigation	Effectiveness of a local seed company in developing technologies fine-tuned to local agro-ecological environment; impact of relaxing liquidity constraints on the poverty reduction potential of new agricultural technologies
Timeline	June 1, 2013 – June 30, 2016
Commodity	Maize

BACKGROUND

Unlike many parts of sub-Saharan Africa, hybrid seed adoption rates amongst Kenyan maize farmers are relatively high, reflecting decades of efforts by the Kenyan government and Kenya Seed Company. Even in the mid-altitude areas that are the focus of this study, hybrid adoption rates hover around 40%, with a strong majority of those not adopting hybrids citing liquidity constraints as the primary reason for non-adoption. However, in these same areas, the median age of the adopted hybrids is 20 years, reflecting the modest rate of innovation and hybrid maintenance investment by the parastatal seed company. Along with the absence of hybrids fine-tuned to the mid-altitude agro-ecology, it is this low rate of innovation that creates the space for a novel market actor to impact small farm living standards with its new generation hybrids.

Social impact investors (including the New York-based Acumen) were keen to underwrite capacity expansion for the Western Seed Company (WSC). These investors were motivated by the hypothesis that an agile, well-funded, locally based and locally-focused seed company like WSC, could create and market the technical innovations needed to boost the productivity of Kenya's small-scale maize producers and significantly improve their living standards. This project is designed to rigorously test this hypothesis by measuring the impact of WSC's maize program on household maize production, total household income as well as indicators of food security and educational investment. This project will study additional regions and treatment arms that are fundamental to understanding WSC's full impact.

PROJECT SUMMARY

Researchers will evaluate the impact of Western Seed Company's (WSC) hybrid maize program on the welfare of smallholder farmers in Kenya's mid-altitude regions. This locally-based and locally-focused seed company is currently expanding into new areas, powered by recent infusions of venture capital. By collaborating closely with WSC, the research team is exploiting this geographic expansion with a two-year randomization design in parts of western and central Kenya, creating well-defined treatment and control groups.

Because of differences between western and central Kenya, researchers expect the constraints, and

ultimately the impacts, in these two regions to be different. In particular, the western region is poorer, and farmers there are unlikely to reap the full benefits of WSC technologies in this liquidity-constrained environment. The research team and partners will relax these liquidity constraints for some farmers in western by providing fertilizer, randomized at the household level.

In summary, this project should generate knowledge about two key issues: the effectiveness of a local seed company in developing technologies fine-tuned to the local agro-ecological environment, and the impact of relaxing liquidity-constraints on the poverty-reduction potential of new agricultural technologies.

RESEARCH QUESTIONS & INTENDED IMPACTS

The research proposed here will speak to three issues:

1. The effectiveness of local seed companies for developing and disseminating seed technologies fine-tuned to the agro-ecological environments where small-scale farmers predominate; and,
2. The impact of relaxing liquidity constraints on the direct poverty reduction impacts of new agricultural technologies.
3. The impact of heterogeneity of soil and information on soil fertility on returns to improved seeds and fertilizer given the existing soils in Western Kenya.

AGRA and others have invested heavily in seed systems throughout sub-Saharan Africa with the expectation that new market players like Western Seed Company can create new prospects for growth throughout the region, especially for the small-scale farm sector. This model is clearly replicable, but the key question is whether it really works and adds value to what can be achieved by multi-national and other traditional market participants. The research sketched out here exploits the opportunity created by the rapid expansion of WSC's capacity and ability to create well-defined treatment and control groups. Researchers also explore whether or not improved seeds can only have impact if financial constraints to the purchase of complementary inputs are relaxed, as well as whether existing soil quality conditions are a fundamental barrier to improved productivity for large numbers of small-scale maize farmers.

COLLABORATORS

Tegemeo Institute of Agricultural Policy and Development
Mary Mathenge, Director
Timothy Njagi, Research Fellow

University of California, Davis
Travis J. Lybbert, Associate Professor
Sam Bird, PhD Candidate

University of Wisconsin, Madison
Emilia Tjernström, Assistant Professor

CAPACITY BUILDING

Most of the capacity building on this project occurs in preparation for fieldwork, in particular the part-time and full-time staff at Tegemeo Institute as well as graduate student researchers from the University of California, Davis. Twenty-five enumerators were trained to use tablets for implementing the midline survey. Though some enumerators had used the tablets in the baseline survey, the training emphasized how tablets can be used to pre-load information for households from the baseline survey in interview prompts.

ACTIVITIES & ACHIEVEMENTS

From the fall of 2013 through early 2014, the research team and partners also implemented a program of soil testing and individualized fertilizer recommendations on respondents' maize fields, together with Crop Nutrition, a leading private agricultural soil laboratory. As part of this, the team collected soil samples on all sample farmers' fields. They also analyzed samples and came up with tailored blended fertilizer recommendations, suitable for the different kinds of soils in the sample villages in Western Kenya.

Researchers conducted a phone survey of the full sample (1800 households) in June 2014 to collect data on maize seed planted in the 2014 main season. The main finding from this survey was low uptake of Western Seed hybrids by farmers in our treatment groups: 9.7% increase in Western Kenya and 3.9% increase in Central Kenya. Low uptake limits the ability of the impact evaluation to identify effects of Western Seed hybrids on agricultural production and household welfare. This finding motivated an intervention by the research team to increase Western Seed hybrid adoption for the 2015 season by offering direct delivery of seeds to treatment villages, which was not part of the original work plan for the year. A second phone survey of the full sample (1800 households) was conducted in November 2014 to collect data on maize harvests for the 2014 main season.

A midline survey of the full sample (1800 households) was conducted in January/February 2015 to collect data for the 2014-2015 cropping seasons, when we expected to see impacts on maize production and household welfare from the study's randomized treatments: introduction of Western Seed hybrids in Western and Central Kenya and distribution of fertilizer to randomly selected farmers in Western Kenya.

Direct delivery of Western Seed hybrids to treatment farmers (900 households) was implemented in February 2015 to encourage adoption of Western Seed hybrids for the 2015 main season. Farmers were given the opportunity to purchase seed at wholesale prices without having to travel from their home village to an agro-input dealer, which was intended to increase adoption of Western Seed hybrids.

As of the writing of this report, a phone survey of the full sample is currently underway to collect initial data on planting and harvesting of maize for the 2015 main season. Preliminary results suggest higher adoption of Western Seed among treatment farmers relative to the control group as compared to 2014: 25.4% increase in Western Kenya (based on responses from 58% of study households) and 19.8% increase in Central Kenya (based on responses from 76% of study households).

Key findings from the midline survey focus on the effect of the two randomized treatment arms of the research design: 1) receipt of a 250 gram sample pack of Western Seed maize hybrids for planting in the 2013 main season by 600 households in Western and 300 farmers in Central, and 2) receipt of a 50 kg bag of MEA fertilizer distributed to 600 households in Western for application to maize in the 2014 main season. The midline survey was designed to capture the short-term effects of these interventions on Western Seed maize hybrid adoption and socio-economic impacts. Our main findings from analysis of the midline data are separated by region:

- In the Western region, the seed treatment generated a 9.7% increase in receiving households using Western Seed compared to 7.9% of all non-recipients, a treatment effect estimate that is different from zero with statistical significance and modestly large magnitude. The combined effect of the seed and fertilizer treatments was a 12% increase in receiving households using Western Seed, suggesting access to fertilizer complements information about hybrid seeds in farmers' seed adoption decisions. Neither the seed treatment nor its combined effect with the fertilizer treatment generated an effect on maize harvested or acres planted in maize that is different from zero with statistical significance. The fertilizer treatment in isolation led to a 132.1 kilogram increase in maize harvest and a 0.17 acre increase in acres planted in maize, with both estimates different from zero with statistical significance at the 95% confidence level.
- In the Central region, the seed treatment generated a 3.9% increase in receiving households using Western Seed as compared to 0.7% of non-recipients, a statistically significant but small difference in magnitude. The seed treatment did not produce an effect on maize harvested or acres planted in maize that is different from zero with statistical significance.

NEXT STEPS

The main activity of the research team during the coming fiscal year is to conduct the end-line household survey for our full sample of 1800 households. The end-line survey is the last of three annual household surveys conducted as part of this project. Upon completion of the end-line survey, data from each of the survey rounds will be compiled into a final dataset for evaluating the socio-economic impacts of Western Seed's hybrid maize program in Kenya.

Researchers hope to finalize publications, reports, and dissemination of study results in the final two quarters of 2015-2016, in conjunction with the completion of data analysis (April 2016 – Sept 2016).

OUTPUTS

Emilia Tjernstrom. BASIS Brief 2015-01: *Learning-By-Doing Vs. Learning-From-Others: Heterogeneity Matters*. March 2015.

Michael Carter, Travis Lybbert, Mary Mathenge and Emilia Tjernstrom. *BASIS Brief 2014-04: Spurring Technological Innovation and Poverty Reduction? Evaluating the Impact of a New Seed Market Actor in Kenya.* March 2014.

Tegemeo Institute, Egerton University. *Evaluating the Socio-Economic Impacts of Western Seed's Hybrid Maize Program: Baseline Report.* June 2014.

University of California, Davis and Tegemeo Institute, Egerton University. *The Impact of Second Generation Maize Hybrids and Fertilizer on Mid-Altitude Producers in Kenya.* September 2015.

Demand and Supply Constraints to Improve Sorgum Technology Adoption and Their Gender-differentiated Effects in Burkino Faso

Lead Institution	Michigan State University
Principle Investigators	Andrew Dillon
Country	Burkina Faso
Mechanism Under Investigation	A supply and demand approach to encourage adoption of improved technologies
Timeline	August 2013-April 2016
Commodity	Sorghum

Background

Sorgum is the main food staple and the most widely cultivated dry-land crop among rural people of the West African Sahel. Both supply and demand constraints significantly reduce adoption of improved sorghum technology resulting in national area shares and yields that are generally reported to be far less than for rice, maize or specialty crops. For example, average sorghum yields in Burkina Faso are estimated at 0.8 tons per hectare, despite the potential to attain over 2 tons per hectare with improved varieties.

Low demand for new seed is caused by many factors. Discernible issues causing this low demand are that seeding rates for sorghum are historically very low relative to other crops, so that small quantities of seed are needed to reproduce a crop. Sorghum seed also stores well from one season to the next, so annual purchase is often unnecessary. Most sorghum seed planted each season originates in the grain stores of farm families, their neighbors, or trusted part-time traders, and is exchanged along social lines except in times of extreme duress. In some areas, there is social stigma associated with not having seed, and thus with seed purchase. Development organizations and donors have sought alternative means to strengthen the linkages between formal and informal seed supply channels over the past decade through the training and financing of seed dealers and farmers, but there remains much to be done to encourage the demand for and thus the adoption of higher yield technologies.

A complementary scheme to address the supply side constraints to providing improved seed access to farmers has been the introduction of a technology for applying small amounts of fertilizer at the time of planting in order to improve yields. This technique, referred to as microdosing, raises yields considerably when applied to the seeding of improved sorghum varieties. The primary drawbacks to microdosing are that it is time-consuming, laborious, and it is difficult to ensure that the correct amount of fertilizer is used for each dose. In addition, there are several major constraints to the widespread adoption of this technology, including access to fertilizer, access to credit, and lack of information and training to farmers.

Project Summary

The primary objective of this experiment is to address farmer constraints from both a demand and supply side perspective. The targeting of seed and microdosing packages based on social network characteristics will also provide policy recommendations on how the diffusion of new technology occurs and who benefits from different targeting strategies within the village. By applying a social

network census in villages of the study domain, researchers are gathering detailed information regarding the specific characteristics of individuals who have little access to credit or knowledge-sharing in the village. Targeting the intervention based on social network characteristics will provide an estimate of the effect of higher connectivity or influence within villages on diffusion of seed and microdosing knowledge and ultimately adoption. As information about new technologies is a primary constraint to demand side adoption, the social network treatments will provide empirical evidence on whether such approaches relieve demand side information constraints. Researchers believe such information will also be of use in designing index-based insurance to encourage investment in sorghum production.

From a supply side perspective, consistent availability within local markets of improved sorghum seed and microdosing packets is also a constraint to adoption. The supply side treatments have experimented with provision of consistent supply in the pre-planting period from agro-input dealers in village markets. This supply side treatment has been compared to three other marketing strategies which test whether credit and commitment constraints are binding for small farmers by offering them options to purchase improved seed and microdosing packets either earlier or later in the season. These treatments are also being compared to a price subsidy treatment to investigate whether commitment devices or price subsidies induce higher adoption.

Finally, researchers are examining important labor and gender dimensions of adoption of this new technology. As microdosing in particular requires significant use of labor, researchers are examining how labor is reallocated across different crops, and how the time use of individual household members is affected. As women and children are a particularly important source of household labor in a variety of dimensions, the research team is paying close attention to their time use. In addition, there are potentially important household welfare implications. Time children spend in the field may displace time spent in school. Women may have to divert their time away from their own legume crops, resulting in lower health and nutrition for the household. Their bargaining power within the household may also be affected.

Researchers have conducted a social network census, in addition to the experiments they have implemented in order to analyze how best to diffuse adoption of a new technology, and whether knowledge of village-level social networks can promote policies that promote more cost-effective ways of diffusing technology. Researchers are now assembling a more complete picture of how new technologies impact not only overall productivity levels, but also household welfare, paying particular attention to the well-being of women and children.

Current Activities and Achievements

During this reporting period the researchers completed the collection of follow-up and adoption surveys. They also focused on cleaning the data from the social network census, household enumeration, and especially the baseline survey. All five data sets are large files with thousands of variables that require careful cleaning before analysis begins. Researchers are beginning to analyze preliminary data from the five surveys conducted and will present key findings and results in the next reporting period. Concerning the supply side treatments dealing with the consistent availability within local markets of improved sorghum seed and microdosing packets, researchers have been able to collect information from take-up rates across the experimental groups. Initial data suggests that there was a much greater fertilizer take-up rate amongst the farmers who made an early commitment to buy. More analysis will be conducted to uncover the policy implications of these results.

Collaborators

Michigan State University
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Estelle Plat
Nicolo Tomaselli

In addition to these three primary collaborators, researchers have also partnered with AGRODIA, an association of agricultural input suppliers, which provided procurement and training of farmers as part of the implementation for the supply side treatments.

Capacity Building

In the past annual reporting period, the MSU team has collaborated with the INERA research team to develop qualitative research, which supports the experimental research design. This engagement has included the INERA team's visit to MSU and attendance at an econometrics methods workshop organized by Professor Wooldridge in the economics department. In addition to the substantial capacity building in which the MSU research team has been engaged as part of our collaboration with our local partners, a graduate student will be funded through the BASIS grant in the upcoming academic year. A second graduate student will work on the project through funding from the Gates Foundation.

Outputs

We have produced non-print outputs over the first two years of the project including five datasets, a BASIS project brief, and 15 stakeholder meetings to build support for the project and solicit feedback from stakeholders on the design of the project. One academic and three informal presentations were organized.

Next Steps

In the next year, the research team will continue to concentrate on data analysis, writing academic papers and policy briefs for broader dissemination, as well as presentations of research findings at academic conferences and other potential venues. As the data sets are analyzed, outputs will

increase, with the current plan to include 4 academic research papers, 2 policy briefs and at least one conference presentation.

More specifically, in Q4 of 2015, the researchers are preparing a descriptive report of the data collected for this project, including sampling methods used and cleaning details. Stakeholders will be updated with a preliminary results presentation covering the first phase of survey work in early November 2015. In Q1 and Q2 of 2016, researchers will be primarily focused on the analysis activities of the project with much of the project's dissemination work focused in Q3 and Q4 of 2016. Please note that researchers had originally planned to include the INERA team in the dissemination activities for this year. But due to the current political situation in Burkina Faso, two policy briefs will be written with the IPA team instead. Dissemination of this information will depend on the political situation as it evolves in the coming year.

Household-Level Impacts of System of Rice Intensification (SRI) in Haiti: An SRI Intervention with Training, Insured Credit, and Coordination by Irrigation Bloc

Lead Institution	University of California, Davis
Principle Investigators	Travis Lybbert
Country	Haiti
Mechanism Under Investigation	Training, Insured Credit, Coordination
Timeline	1 May 2013 – 30 September 2016
Commodity	Rice

Background

The *System of Rice Intensification* (SRI) is a potentially high-yielding, low external input method for rice cultivation that can generate substantial and persistent increases in yields. SRI has received widespread attention as a pro-poor technological innovation that could help small-scale farmers meet their food needs while lowering expenditures on inputs such as seeds, water, and fertilizer. However, adoption has been lower than might be expected given its apparent benefits, and substantial disadoption has been observed in some locations.

Substantial questions remain regarding household welfare impacts of SRI. Because SRI requires higher labor inputs than traditional methods for land preparation, crop maintenance, and water management, adoption of SRI typically leads to reallocation from other economic activities. The resulting decrease in household income from other activities may offset the income increase from higher SRI yields. Researchers aim to build on to move beyond yield impacts and towards a better understanding of overall household welfare effects of the technology and the reallocation of household resources it induces.

One unexplored area of research is the effect of coordination on adoption decisions and on the ultimate success of SRI. Due to the need for intermittent flooding and draining, SRI requires more regular cleaning and maintenance of shared drainage canals than necessary under traditional methods to enable more precise water management. Because irrigation and drainage canals are shared, coordinated adoption and canal maintenance may yield greater benefits than adoption in isolation.

Project Summary

This project will conduct a rigorous evaluation of the household-level impacts of a coordinated SRI intervention being launched by Oxfam America (OA) in Haiti's Artibonite Valley. After piloting several elements of the integrated SRI intervention in recent years, Oxfam is prepared to scale-up the program and is eager to understand its impacts on rural households – both to improve its Haiti program and inform its support of SRI initiatives worldwide.

Based on lessons learned in the first few years of its program, Oxfam formulated an SRI intervention that targets entire irrigation blocs. This coordinated approach aims to incentivize full SRI adoption on all the plots within selected irrigation blocs, which are delimited by a network of shared canals and drains.

The shared canal system raises questions about coordinated use of public goods, and this project will explore whether efforts to coordinate farmers sharing a canal to adopt together increases their likelihood of adoption and whether benefits are greater under such a coordinated approach. Substantial research exists on decentralized common-pool resource management, but very little on the role of common-pool resources in technology adoption decisions or the possibilities for coordinated adoption as a way of improving outcomes.

This evaluation directly complements work by USAID to actively promote SRI elsewhere in Haiti as part of the Feed the Future subprogram Watershed Initiatives for National Environmental Resources (WINNER) project. The evaluation researchers have designed will generate insights into how and how much SRI impacts rural livelihoods in these Haitian contexts – as well as providing a basis of evidence for addressing important lingering questions about the efficacy and promise of SRI for rice farmers in other poor countries.

Current Activities and Achievements

Researchers have been able to stay mainly on target with project goals this reporting cycle.

Implementation of the SRI project began in spring and continued through the harvest in November. Researchers conducted intra-seasonal data collection and field monitoring, in conjunction with FAMV. Technical monitoring took place over the course of the summer with a small sample of farmers, and a mid-season survey was conducted with approximately 200 farmers in September. Mid-season survey covered rice cultivation details (inputs, prices, labor use, etc.) and technology choice. Preliminary summary statistics have been compiled from this data and the data from the baseline survey and shared with partners.

Repayment of agricultural loans took place after the harvest season, starting from the end of November and continuing still. Oxfam America has been working with local partners – farmers' associations, credit union, and local agricultural extension office – to plan the 2015 field season, including training, technical support, canal cleaning, and organizational support to the associations and water management committees (to be formed this year). Farmers faced serious delays in planting due to drought across Haiti, but as of now all farmers have been able to start planting.

Researchers conducted the midline survey in February-March, collecting data from approximately 825 farmers in the four study blocs. In April researchers finished conducting public goods experiments to measure cooperative behavior among groups of neighboring farmers from the four study blocs. They were conducted with 240 farmers, with as many of the same farmers as last year, all in groups with other farmers who farm adjacent plots.

The team continues to work with partners on repayment of agricultural loans from last year and disbursement of loans for this year. Loans have been disbursed to farmers who repaid last year and wanted to borrow again this year. However, the credit program continues to pose significant problems. Repayment rates were lower than expected, and farmers who did not repay last year's loans will be ineligible for a loan this year. Researchers have been working with partners to respond to a major miscommunication crisis in which farmers selected to receive credit at a subsidized interest rate were led to believe that they would only be required to pay back 50% of the amount they borrowed. Several meetings with local partners have been held led by the research team to try and clear up this misunderstanding and come to an agreement to move forward with the credit program for this year.

Baseline and midline household surveys have been collected and some summary statistics from the surveys are emerging but no in-depth analysis of that data is available yet.

Collaborators

Host Country PI:
Robers Pierre Tescar
Professor, Faculté d'Agronomie et de Médecine Vétérinaire (FAMV)
Université d'Etat d'Haïti

Collaborating Researchers:
Michael Carter, Professor, Agricultural & Resource Economics, UC Davis
Abbie Turiansky, PhD Candidate, Agricultural & Resource Economics, UC Davis

Collaborating Institutions:
Oxfam America-Haiti, Route Kenscoff, Pétionville, Haiti
CAPOSAV, Saint Marc, Haiti
Association Irrigants Liancourt-Artibonite (AILA), Liancourt, Artibonite, Haiti
MAFLPV, Liancourt, Artibonite, Haiti

This research project builds directly on a smaller, pre-existing project by an implementing partner. Oxfam America-Haiti received a grant from the Barr Foundation to support the initial SRI intervention described in the initial proposal. This grant was recently renewed to provide continued support. This Barr Foundation project has provided valuable lessons for the project. Since the same Oxfam America-Haiti staff are implicated in both projects, we are implicitly coordinating quite closely with this project and learning directly from these experiences.

Before this project was even launched, the research team had discussed the project with colleagues from USAID in Haiti, including the earlier WINNER project led by Chemonics that included an important SRI component. USAID had recently funded a baseline survey in St. Marc, on the edge of the Artibonite Valley. They shared their survey instruments with researchers to help with the design of the baseline survey questionnaire. Researchers are in continued contact with the USAID mission in Haiti regarding their potential future plans to launch an SRI intervention with farmers' associations in St. Marc.

Capacity Building

Most of the capacity building provided by this project is being handled through a research partner, FAMV. In this reporting cycle, participants in enumeration training were selected learn how to collect data for the baseline household survey. This included training them in use of the tablets used for electronic data collection, familiarizing them with the survey instrument, and training them in good survey methodology.

The project also supports the work of two FAMV technicians throughout the growing season to monitor the agronomic performance of the SRI plots as compared to the non-SRI plots. These technicians work closely with co-PI Robers Pierre Tescar, but also coordinate with field partners. These technicians, who recently graduated from FAMV, are gaining valuable field experience through this work.

BASIS Researchers had several meetings with Oxfam, FAMV, CAPOSOV (the local credit union managing the credit program) to evaluate the first year of the program, share preliminary research results, and plan for year 2. The team also met with the local farmers' associations for similar evaluation and planning.

Outputs

As data collection and analysis is still in early stages, the outputs are limited. However, there has been one internal presentation on this project by Travis Lybbert at the BASIS Technical Meeting in November 2014, as well as a September 2015 internally released paper written by Abbie Turiansky, a UC Davis graduate student working on the project, entitled, "Collective action in games as in life: Experimental evidence from canal cleaning in Haiti."

Next Steps

The main activity to be undertaken in the next reporting cycle is the data analysis of the baseline and midline household surveys. Preliminary results are expected thereafter. The team will also be conducting additional surveys and analyzing the results of a public goods experiment.

Meanwhile, program implementation will continue, led by Oxfam America. Activities will include:

- Recruiting and training of farmers in SRI using the farmer trainer model.
- Technical assistance/follow-up program with farmers recruited from treatment blocs.
- Providing credit to farmers in treatment and control blocs.
- Water management (cleaning of the primary canals/drains to be provided by the program, including training in water management to encourage farmers to manage and clean secondary and tertiary canals and drains in their blocs.

A Multiple Intervention Approach to Increasing Technology Adoption with a View Towards Scaling-up: Evidence form Mexico

Lead Institution	University of California, Los Angeles
Principle Investigators	Aprajit Mahajan
Country	Mexico
Mechanism Under Investigation	Multiple Interventions Approach
Timeline	1 January 2013 – 30 October 2015
Commodity	Maize

Background

Crop yields in much of the developing world remain below potential partly due to low adoption of profitable technological packages, such as improved seeds and fertilizer. Even in Mexico, a birthplace of the Green Revolution, only slightly more than half of all producers use hybrid seeds, and maize yields average about three tons per hectare, similar to those in Africa. Yield numbers are even lower for farmers without irrigation. Persistently low yields keep farmers poor. Research has shown that adoption of improved technologies, such as improved seeds and fertilizer, can increase yields, yet adoption rates remain low. Smallholder farmers face a number of prominent barriers to technology adoption, including uncertainty about profitability, risk aversion, lack of credit, and insufficient information about input use. There remains uncertainty, however, about the relative importance of these different constraints to the adoption of improved agricultural technologies. Without a clear understanding of the relative importance of these different barriers, it can be difficult for a government to design sound policies.

Project Summary

This project seeks to better understand and address the barriers to the adoption of improved technology in Mexico, as well as their relative importance. Researchers are implementing an experimental evaluation of an intervention targeted at Mexican maize smallholders (defined in this program as 1-8 hectares of holdings, producing less than 3 tons of maize per hectare). The intervention hopes to increase maize yields among smallholders by simultaneously addressing the main barriers to adoption.

To evaluate these interventions, the research team is implementing a randomized control trial (RCT) with a treatment arm that receives all experimental interventions and a control arm that receives non. The idea of the study is to measure the "all-in" effect first in the first year, and if an effect is found, try to decompose it by changing one intervention at a time in subsequent study years. To disentangle the relevant constraints to technology adoption in Mexico the researchers are, in effect, running a "horse race" between the different interventions, each targeting a single adoption constraint. This will allow researchers to identify the most cost-effective inputs and those that have the greatest impact on yields.

The Mexican government requested this project and the impact evaluation with the aim of determining how to best design such interventions before scaling it up to the entire small farmer population. The government will use the results from this study to decide whether its credit programs and technology assistance programs are effective. In addition, after being invited by the government and recognizing the policy significance of this project, the International Maize and

Wheat Improvement Center (CIMMYT) intends to use the results form this study to inform their policy recommendations worldwide.

Collaborators

Host Country PIs:
Dr. Enrique Seira, ITAM

Collaborating Researchers:
Dr. Xavier Giné, The World Bank

Collaborating Partners:
Carolina Corral, Research Director, Que Funciona para el Desarrollo (QFD)

Current Activities and Achievements

In this reporting cycle researchers aimed to relax diverse constraints on farmers' abilities to follow individualized plot recommendations. First, the teams worked with a high-quality international agricultural dealer, YARA, to provide a set of more efficient fertilizer packages based on the results of almost 1000 soil analyses that provide the adequate chemical concentrations for farmers' plots. Second, we issue in-kind grants for sowing to smallholder producers. The amount of the grant is USD 138 per hectare (2,000 Mexican pesos), corresponding to 30% of production costs and 50% of input costs in our previous surveys. The arms in this year of the project are:

- T1: Individualized soil analysis and recommendations and an inflexible in-kind grant along with agri-cultural extension services.
- T2: Average soil analysis and recommendations and an inflexible in-kind grant along with agricultural extension services.
- T3: Average soil analysis and recommendations and an inflexible in-kind grant along with agricultural extension services.
- T4: Average soil analysis and recommendations and no grant along with agricultural extension services.
- T5: Control arm

The project was implemented in 13 municipalities with substantial smallholder maize farmers in the Mexican state of Tlaxcala. A total of 34 promotional meetings were held in the principal towns in each municipality during January 2015. The promotional meetings were organized by the research team and typically took place in a large public space (e.g. a municipal auditorium) and lasted about 45 minutes. The meetings introduced and explained the intervention as well as the lottery design and eligibility requirements. The researchers limited eligibility to farmers who farmed (owned or rented) at least one hectare of land and no more than 15 hectares, were aged between 18 and 70 years and where planning to sow maize in the 2015 growing season. A total of 1157 farmers attended the promotion meeting, and 981 completed an initial registration form indicating interest in the program and in taking part in the lottery.

Following the promotion, each farmer who had completed a registration form was visited by the research team (February and March 2015). During this visit, a detailed baseline survey was carried out and farmers were asked to choose a one hectare sub-plot to register into the program and GPS coordinates for the sub-plot were recorded. More than 30 percent of the chosen sub-plots were located in plots that were larger than 1 hectare so that in these cases we can compare farmer

practices and outcomes within each plot. Finally, soil samples were collected from the program sub-plot and sent to Fertilab for analysis. In March 2015, the research team randomized the 793 (out of 981) farmers who sowed maize into the five treatment arms using a stratified design.

The first (baseline) survey was carried out in Feb-Mar 2015 and collected a range of data on farmer characteristics as well as agricultural practices in the past growing season. The second survey was carried out in April 2015 and collected information on expectations as well as information on farmer activities in the current season thus far. A midline survey was carried out in September 2015 and the endline survey will be carried out in April 2016.

Some preliminary results on take-up of the fertilizer and sowing machinery are available. Take-up has been quite impressive. The use of sowing machinery ranges from 77-93% in T1-T3 and was up 16% in T4. These results are particularly impressive for T3 which was not required to use its grant for the sowing machinery at all and the results for T4 are also encouraging in that group four farmers paid out of pocket for the sowing machinery.

The take-up of the first fertilizer packages remains comparably high among T1-T3 and again the take-up is impressive for T3, which was not required to purchase the package. Researchers found similar results for the second fertilizer package although there is a drop-off in take-up by T1, which the team is currently investigating.

The results on the extension services part of the intervention again showed take-up rates for the first two group meetings remaining impressively high for T1-T3 and also reasonably high for T4. The extension services were provided gratis to all arms with no particular incentive to attend and its' high take-up is further evidence that farmers found the program and the service advice helpful.

Finally, the research team measured the number of plants in 10 linear meters at several (15-30) points within each sub-plot to get a sense of plant growth. The results again are very encouraging – in groups T1-T3 there is a 15-18% increase in the *number* of plants. Assuming normal weather conditions, this increase along the extensive margin (i.e. an increase in the total number of plants per hectare) will complement the increase along the intensive margin that the fertilizer use will encourage (increasing the weight of the grains on the cob). As a result, researchers remain optimistic that significant effects on yields will be seen.

Capacity Building

The research team has been working closely with a number of in-county partners creating productive collaborations and capacity building opportunities.

Ipampa, one such partner, is a Tlaxcala based agricultural extension services company founded by two female agronomists five years ago to provide assistance to farmers in this particular geographical region. Ipampa works in partnership with Atider, a local research company with 20 years of experience in developing tailored fertilization recommendations based on soil analysis and providing agricultural extension services to maize farmers in Mexico and China. Ipampa was in charge of coordinating the farmers sowing dates with the pneumatic drills owners, hiring, training and overseeing the nine extension workers who attend the sowings, organizing the farmers´ trainings and the second application of the fertilizers.

Fertilab, another working partner, is a top-tier soil laboratory in Mexico. Fertilab is the only Mexican lab approved by the North American Proficiency Testing Program (NAPT) and is highly

recommended by CIMMYT. Fertilab provided the soil analyses to construct this project's tailored recommendations for each of the plots in the 2013-2014.

Qué Funciona para el Desarrollo AC (QFD) is a non-profit organization funded in 2012 by Enrique Seira and based in Mexico. QFD unites prominent national and international academics, as well as policy makers with the purpose of doing rigorous research that is useful and pertinent to further development. QFD evaluation team is in charge of overseeing that each partner follows the time schedule of the program and evaluate the impact of the interventions.

Outputs

As surveys are still underway in this reporting cycle, there are no new public outputs. There have been several internal reports and presentations, (such as the BASIS Technical Meeting in November 2014 at George Washington University in Washington D.C.) based on baseline and midline results, but main outputs are planned for 2016.

Next Steps

In the next reporting cycle, the remaining surveys will be conducted such as the harvest machinery census, and commercialization survey and a second follow up survey. The data cleaning and analysis of these surveys should begin in December of 2015 and last until June of 2016. As a result of the completed analysis, outputs for this project will be plentiful in the next year.

In January 2016, an all day workshop is planned to discuss preliminary results with Government Officials, NGOs and Farmers´ Organizations. By May 1st, 2016 the preliminary findings are set to be presented at Yale University in a seminar by Aprajit Mahajan. In June, Carolina Corral's seminar on the project's preliminary findings will be presented in Mexico at the Colegio de Postgraduados de Tlaxcala. By July 2016, a policy brief and a first draft of the research paper will be published in both English and Spanish and sent to local policy makers, the World Bank, and FAO researchers and implementers. Four separate seminars, presented respectively by Aprajit Mahajan, Carolina Corral, Xavier Giné, and Enrique Seira, will occur in September and December of 2016 reporting on the final findings of the completed research project.

Evaluating the Effect of Site-Specific Soil Information on Farmer Input Choices and the Relationship Between Poverty and Soil Quality

Lead Institution	Columbia University
Principle Investigator	Cheryl Palm
Country	Tanzania (Morogoro district)
Mechanism Under Investigation	Site-Specific Soil-Specific Information for Farmer Input Choices
Timeline	1 March 2014 – 1 March 2017
Commodity	Maize

Background

Now is a promising time for agricultural development in Sub-Saharan Africa. After decades of stasis, in part due to soil nutrient depletion following years of insufficient organic and inorganic fertilizer applications, cereal yields have recently begun to increase in some areas, particularly in countries such as Tanzania where governments have instituted programs subsidizing mineral fertilizer and hybrid seed for smallholder farmers. Considerable work remains to sustain and improve early yield gains that may result from these programs and to help farmers better manage their soils and use scarce resources more efficiently, especially in a context where more extreme and volatile weather events are expected due to climate change.

Poor soil quality and the associated low crop productivity is linked to the pervasive rates of poverty and malnutrition ensnaring much of Africa. One particular challenge is that farmers, in particular small-scale farmers, do not know the status of their soils. Despite considerable heterogeneity in soil types and other biophysical conditions across farmers and farm fields, governments generally set a single mineral fertilizer application recommendation for a region or country. While uniform recommendations can succeed up to a point in improving yields, obtaining higher yields requires a targeted approach that addresses specific soil constraints to crop production and makes efficient use of environmental and economic resources. Current resources for soils information provision are lacking in Sub-Saharan Africa. Laboratories that conduct soil tests and make recommendations are few and far between and the costs are beyond the reach of most of the farmers in the region. Without such soils information it is not possible to make recommendations specific to farmers' soils and growing conditions.

Project Summary

A team of researchers and collaborators at Columbia University's Agriculture and Food Security Center has developed a lab-in-a-box, a rapid on-farm soil diagnostic kit. The kit combines in-field measurements of essential soil physical and chemical parameters with information communications technology (ICT) to provide farm-specific management recommendations. The tool, also known as SoilDoc, has been validated and calibrated with standard wet chemistry procedures.

The research team will test the central hypothesis underlying the development of SoilDoc: that farmers will apply productive inputs more effectively and increase yields in response to improved access to information about soil quality. This research approach employs a randomized control trial (RCT). The research intention is to evaluate how improved soil information impacts yields,

production inputs used by farmers, and welfare of farming households. The study will take place in the Morogoro district of Tanzania.

This study further addresses the reasons why farmers may be unwilling or unable to use information about soil quality to enhance investments in production. Farmers may be unwilling to use the information if they do not trust the source that is providing the information or the way in which the information was developed. The study will disseminate information about soils through agricultural extension agents. Each of these agents is attached to one village in the district and has established relationships with the farmers. Farmers may be unable to act on the information about soil quality if they do not have access to needed inputs or if they do not have the resources to purchase the inputs. Some farmers in the study will receive a cash grant together with information about their soils, some will receive a cash grant only, and some will receive soil information only. In this way researchers will be able to disentangle the relative importance of asset constraints vs. information constraints, and to assess whether an intervention that addresses both simultaneously increases the impact over either in isolation.

Current Activities and Achievements

In this annual reporting period, one of the main activities undertaken by researchers was the collection of soil samples. Approximately 2/3 of the 1,100 soil samples were collected, less than the total number of samples needed. This because sampling proved more challenging and time consuming than expected for the following reasons:

- The long distance to some farm field plots, often over a kilometer from the house where interviews had been conducted,
- Difficulty in finding original farmers from household surveys, some moved away to different villages and others were temporarily away from their homes visiting nearby villages or markets
- Some farmers no longer wanted to participate in the project

As a result, the work had to be conducted in two parts: October – December 2014 and then resumed in February 2015-April 2015. This will not affect the results for most soil parameters measured, except for nitrate, which can vary dramatically with seasons. Fortunately, nitrate is not one of the analyses used for the recommendations as nitrogen is usually a recommendation for all fields.

These samples that were collected were then analyzed with the SoilDoc portable lab sensors for extractable NO_3, P, K, S, active C and pH. These data are the basis for fertilizer recommendations that the project will give to selected farmers in treatment villages regarding appropriate fertilizer input use on their soils in the third year of the project.

In addition to the soil collection and analysis, researchers conducted an additional survey. The additional survey covered approximately 950 households (out of 1100) to gather information on farmers' storage, buying and selling of grains, maize sales, knowledge of current fertilizer government recommendations, fertilizer quality, and subjective expectations of how yields respond to different fertilizer amounts. The additional information will improve the research team's ability to identify reasons why farmers do or do not use inputs and why they do or do not increase input use in response to information about their soils and/or a subsidy for purchasing inputs. The large attrition rate resulted from the finding that approximately five of the villages do not grow maize

during the long rains. Current work is being done to determine how critical it is to replace those farmers. Preliminary data analysis was conducted on the August 2014 baseline survey.

Preliminary results, based on the subsample of data for soil results available at the time of the analysis, suggest that farmers' assessments of their soils are closely related to their N03 content (specifically, to whether their soils can benefit from the addition of N03) but not related to measured dimensions of soil quality. An analysis was initiated of the correlations between farmer wealth, proxied by an asset index, and the soil quality of their main maize plot. Better off farmers do not seem to own better quality soils. As the rest of the soil analyses are completed and added to our data, we will rerun and develop this analysis. The preliminary findings are not consistent with what has been found elsewhere in East Africa (Marenya and Barrett, 2009) and could suggest an interesting and complementary story. So far, researchers find that soil quality is not necessarily better in more remote areas further from village centers.

Collaborators and Partnerships

Agriculture and Food Security Center, The Earth Institute, Columbia University
Lydiah Gatere, Postdoctoral Research Fellow
Aurelie Harou, Postdoctoral Research Fellow
Kevin Tschihart, Agriculture and Socioeconomic Coordinator

Center for Climate Systems Research, The Earth Institute, Columbia University
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Department of Soil Science, Sokoine University of Agriculture, Tanzania
Nyambilila Amuri, Lecturer
Johnson Semoka, Professor

Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture, Tanzania
Chris Magomba, Lecturer

Capacity Building

1) The BASIS funds are supporting a MSc student at Sokoine University. The participant was selected based on academic performance at undergraduate studies and on competitive basis as per Sokoine University admission requirement and scholarship award. The participant is trained in Msc Soil Science and Land Management for two years. The first year consists (the grant year currently ending) of coursework and proposal development, while the second year (2015-2016) is on research work. Her research topic is "Soil nitrate test to assess nitrogen fertilizer needs for tropical soils: A case of Morogoro Rural, Tanzania." The objective of the research topic is to determine best

sampling time for fertilizer recommendations and response of maize to different rates of nitrogen fertilizers based on soil nitrate test by soil doc. The goal of this training activity is to build capacity in soil fertility, specifically soil testing methods for accurate fertilizer recommendations to improve both soil quality and productivity.

2) Enumerator training: We conducted two trainings for enumerators in year two.

In February, we conducted an enumerator training to conduct phone interviews with farmers as a follow up to an issue identified in the surveys. All trainees/enumerators were graduates from Sokoine University of Agriculture (Bsc. Agricultural Economics and Agribusiness).

In August, we conducted an enumerator training to conduct the additional baseline survey described in point "c" above. All trainees/enumerators were graduates from Sokoine University of Agriculture from different fields of agriculture.

3) A student at the University of Illinois has worked as a research assistant to map soils data for the Morogoro region from AfSIS data and to complete and map a carbon index score, a pH index score, a slope index score and a soil health index score based on these values. We plan on completing similar analyses for the BASIS sample.

Outputs

The out puts for this reporting cycle include a November 2014 BASIS technical meeting presentation and the July 2015 AAEA presentation at the joint session organized by Travis Lybbert.

Next Steps

In the next year, researchers will embark on round two of data collection for the follow-up to the baseline survey collecting information about farmer marketing, fertilizer use, beliefs about fertilizer effects, and knowledge of government recommendations. Twenty-five enumerators will be trained on Samsung tablets to collect year 2 of the data. The survey instrument will almost identically resemble the round 1 survey, with a few additional modules.

Once the two rounds of data is collected and combined with the soils data, the researchers will extend their baseline analysis to include variables related to farmer beliefs about fertilizer effects on yields and marketing.

Progress with fertilizer treatments and outreach is planned. The research team will finalize agreements with input dealers who are bringing mineral fertilizer to the treatment villages and who will accept project vouchers. The information and voucher treatments will then be distributed to farmers in meetings in the villages. The team is working to design an information sheet for farmers that will present the farmer's specific soil results and management recommendations in a clear and effective manner. The design will be completed and the farmer-specific sheets will be disseminated along with the treatments.

Complementarities of Training, Technology, and Credit in smallholder Agriculture: Impact, Sustainability and Policy for Scaling-up in Senegal and Uganda.

Lead Institution	George Washington University
Principle Investigator	Stephen Smith
Country	Senegal and Uganda
Mechanism Under Investigation	Training, Technology and Credit
Timeline	1 April 2013 – 30 September 2017
Commodity	Varies by program

Background

Many proven technologies and improved farming practices hold great promise for boosting agricultural productivity and reducing poverty in developing countries, but the adoption of such technologies by smallholder farmers, especially in Sub Saharan Africa, has been slow, at best. The recent development economics literature has focused on the need to address fundamental constraints to moving out of poverty in general and low-productivity smallholder agriculture in particular. Lack of knowledge, lack of access to markets, credit restrictions, uninsured risks, and problems of coordination with neighbors have all emerged as key constraints.

These constraints sometimes act in a complementary manner. For example, improved knowledge is of limited usefulness if farmer training requires the purchase of additional inputs and capital goods. The relaxation of credit restrictions is of limited benefit if farmers do not understand how to use their loans productively. Similarly, there are complementarities between inputs, farming practices and technologies. Poverty alleviation activities and programs may achieve greater effectiveness and efficiency through the recognition of these interdependencies.

Project Summary

The research team is studying two agricultural development programs that target some of the poorest smallholder farmers, particularly women, in Uganda and Senegal. The Uganda program promotes the use of improved seeds and fertilizer by individual farmers through demonstrations by 'model farmers' and by providing a proactive supply of inputs through a network of village promoters. The Senegalese program promotes the use of drip irrigation systems and a complementary package of improved inputs. Despite these methodological differences, the two programs both attempt to ease constraints to adoption by combining time-limited investments in human capital (through extension and training) and physical capital (through subsidization or grants).

Current Activities and Achievements

This reporting cycle has been a period of high productivity for both the Senegal and Uganda projects. Field research is active and ongoing. In addition to the program-specific activities enumerated below, fresh research questions have emerged that are over-arching. A new framework has been developed to increase focus on the role of women working outside the home and possible implications for food security.

Senegal

Drip irrigation is widely considered to be a promising technology for sustainable agricultural intensification, as it can achieve a simultaneous increase of yields and a decrease in input use (water, fertilizer and pesticide), and has a high rate of return on investment and potential for poverty alleviation. However, while highly effective in controlled conditions or in demonstration farms, its adoption by smallholder farmers in developing countries, especially in Sub-Saharan Africa, is still limited. The failure was attributed to factors such as mismanagement, disregard for agronomic recommendations, lack of maintenance, small plot size, and lack of access to technical support, complementary inputs, spare parts, and markets.

Researchers are now working to analyze the impacts and sustainability of PAPSEN, a program that combines drip irrigation with a locally optimized package of improved inputs and intensive extension services. This year site selections were finalized for 62 randomly assigned villages to receive the irrigation systems, and 62 villages that will not receive irrigation (control group). Pre-tests of the baseline household surveys were completed in a sampling of villages. Partners are in the field collecting final village level data and farmer association information. Researchers are enthusiastic about the substantial recent progress following previous unexpected delays in project roll-out.

Uganda

Launched in August 2008, BRAC's agriculture program seeks to increase the usage of improved inputs (fertilizer and improved seeds) and the productivity of low income, smallholder women farmers, by providing extension and supporting a network of *model farmers* and *community agriculture promoters* (CAP).

- ***Model farmers*** received six days of training in crop production techniques, adoption of new crop varieties and pest control, as well as follow-up refresher courses. Then, they were made responsible for providing a three-day training activity for other ("general") farmers in their villages.
- ***Community agriculture promoters (CAPs)*** were selected from the same populations, and their role is to make available and sell advanced agricultural inputs in the villages, such as improved seeds and fertilizers.

Not all areas participating in the program are served by both CAP and model farmers: some areas have only CAP, some have only model farmers, and some have both. In addition, BRAC Uganda also runs a microcredit program, and even though BRAC's financial services are formally separate, there is some geographical overlap between the two programs. One part of the research will attempt to exploit this spatial heterogeneity in coverage of the various program components to study and evaluate their complementarities. BRAC is now planning to withdraw CAP and model farmer support from certain randomly selected villages; this provides a unique research opportunity to both study the complementarities between the program's components, as well as the impacts of various forms of program withdrawal. Support will be phased out, with half the villages randomly selected to receive continued services for an additional two years. Accordingly, the second line of investigation will employ randomized control trial (RCT) methods to examine the impacts of scaling back, as well the impact on long-term outcomes of prolonging the intervention by another two years.

Researchers spent this reporting cycle successfully completing the follow-up round of household

surveys. The data was implemented, collected, coded and loaded in STATA, in accordance with the work plan schedule. A first paper based on the data analysis has been written and will be presented in November 2015. The researchers are also in the process of developing plans for the next round of surveys. Food security and nutrition are important aspects of the program but these issues were not directly addressed in the streamlined survey of the previous round but will be included in the next. In addition, researchers are now deploying a special supplementary survey of area agro-dealers.

Collaborators and Partners

a) BRAC Uganda
1. Hannan Ali, Director, BRAC Uganda Agriculture and Nutrition program
2. Munshi Sulaiman, BRAC International Director of Research (returned to Kampala from his postdoc at Yale University Economic Growth Center July 1, 2015, formerly held the position as BRAC Africa Research Director)

b) Senegal Government PAPSEN Project; Personnel from:
1. Ministry of Agriculture
2. ANIDA Agency

c) Israel MASHAV
1. Tammy Erann-Soussan, Israeli MASHAV project coordinator
2. Shulamit Kurzon van Gelder, MASHAV evaluation unit representative
3. Dr. Dov Pasternak, MASHAV consultant; Irrigation expert

d) Columbia University
1. Dr. Shauna Downs
2. Dr. Jessica Fanzo

e) Aalto University
1. Dr. Yao Pan, Assistant Professor of Economics (co-investigator, BRAC Uganda agriculture research component of the overall project)

f) Brookings AGI
1. Dr. Amadou Sy, Director, Brookings AGI provisional main Brookings liaison. *Note: In June 2015 we were affected by the untimely death of Dr. Mwangi Kimenyi, former AGI Director
2. Andrew Westbury, Assistant Director, Brookings AGI

g) Economic Policy Research Center (EPRC)
1. Dr. Caroline Nyakaisiki, Researcher
2. Dr. Ibrahim Kasirye, Researcher
3. Dr. Sarah Ssewanyana, Director

Capacity Building

Covering the projects in both Senegal and Uganda, capacity building was spread across many sectors. Local partners are gaining in capacity in three main ways. First, they will learn about rigorous and effective policy analysis in a hands-on way: EPRC and CRES will write the first drafts of the policy pieces; then, Brookings and GW researchers are providing feedback, and advise them through additional analysis and revisions of the paper. Second, EPRC and CRES researchers are engaged in the field evaluations and are gaining experience in design and execution of impact evaluations. Thirdly, this experience is being complemented by formal training workshops in experimental design and econometrics. GWU and BRAC-Uganda researchers will jointly author publications. In Senegal, field research is being conducted in close cooperation with local implementers. Researchers from the local implementers are taking an active part in the experimental design, data collection and analysis, and will be invited to receive formal training in impact evaluation and statistical analysis from a co-investigator.

In addition, one graduate student from GWU has received substantial training and on the ground experience in both Senegal and Uganda. This student was involved in gathering field surveys and in the managing, cleaning and analysis of the data collected. The student co-authored two papers and was able to substantially progress dissertation research.

Outputs

a) Print outputs:
1. Ram Fishman, Stephen C. Smith and Vida Bobic "How Sustainable Are Benefits from Agricultural Extension Programs for Smallholder Women Farmers? Evidence from a 'Reverse-Randomized Control Trial' in Uganda," Paper to be presented at the Northeast Universities Development Consortium Conference (NEUDC), Brown University, November 2015. 39 Pages.

2. Vida Bobic, Stephen C. Smith and James E. Foster, "Measuring Multidimensional Women's Economic Empowerment: Framework and Application to Programs for Women Smallholder Farmers in Uganda and Senegal: Research Note," draft, August 2015. At this stage, this note is in the form of a proof of concept piece, as we are working with a cross section in the Uganda case, and a pretest sample of only 40 households in the latter case. It is currently considered an internal working document.

3. Expanded working paper (Note: the first draft of this paper was mentioned in last year's report with a slightly different title): Yao Pan, Stephen C. Smith and Munshi Sulaiman "Agricultural Extension and Technology Adoption for Food Security: Evidence from Uganda." Note: This paper has been accepted for the IZA working paper series and is available at: IZA Discussion Paper 9206, July 2015, 47 pages, available at: http://ftp.iza.org/dp9206.pdf. It will be submitted for publication soon.

b) Non-Print Outputs:
1. Data
a. Two rounds of household data from BRAC agricultural extension program study have been coded and cleaned
b. Pretest survey and focus group field notes from Senegal
c. Initial set of village level survey data and farmer group information

c) Conferences attended and other presentations
"USAID and GW Discuss Ending Extreme Poverty," Speakers: Alex Their and Stephen C. Smith, Washington DC, January 27, 2015; presentation slides available:

http://www.gwu.edu/~iiep/events/ At this presentation, the PI briefly described our BASIS-funded research in Senegal and Uganda. This may have provided valuable exposure also to USAID.

BASIS Annual Technical Committee Meeting research workshop, held at GWU in Washington DC, presented work in progress, including the RDD paper and plans for the reverse-RCT paper, November 5-6, 2014 8

The RDD paper was presented by Yao Pan at three settings: Oxford University The HECER-WIDER development lunch (Helsinki) The GWU development lunch, all in 2014

Next Steps

The next reporting cycle will be a period of high activity in both Senegal and Uganda.

Senegal: Following completion of the supplemental farmer association and village level data collection, researchers will initiate and complete the baseline household survey in November 2015, building on previous pretest experiences. Household surveys are being implemented in conjunction with our local field consultant, Dr. Samba Mbaye. The remaining 62 irrigation systems should be installed in 2016. Researchers plan to monitor this at group and village level, including through short surveys of members of the farmer associations. While delays in the irrigation systems roll-out have been unfortunate, supplemental approaches have been formulated to study mechanisms of collective action challenges. Researchers also plan to take advantage of village randomization to study what happens after a major village-level development program (such as PAPSEN irrigation) is announced.

Uganda: Researchers are planning to implement with partner, BRAC, the final two rounds of household data collection of the reverse-RCT research, in February 2016 and September 2016. The agricultural dealer surveys will be implemented and contracted to the field consultant, with the support of BRAC, in October-November 2015. Early in the work period researchers will submit to a refereed journal the paper on the RDD analysis of earlier panel data surveys, "Agricultural Extension and Technology Adoption for Food Security: Evidence from Uganda," by Yao Pan, Stephen C. Smith and Munshi Sulaiman (IZA DP 9206). Finally, the ongoing analysis of household data from the first two seasons of the reverse-RCT phase-out will continue and be incorporated into findings to further develop our draft initial research paper. Research findings will be presented at three or more venues, including NEUDC at Brown University in November 2015. Researchers are hoping to incorporate data collected in February 2016 into the initial and or additional research paper(s). Also a formal working paper is in progress, likely to emerge in the form of a IZA discussion paper.

RESEARCH THEME C: SYNERGISTIC PACKAGES OF FINANCIAL AND TECHNOLOGICAL INNOVATIONS

Upward mobility for small-scale farmers may not only require risk mitigation and connections to markets, it may also require access to the financial resources that would allow farmers to invest and experience a discrete jump in income and productivity. In much of the developing world, productivity continues to fall short of potential, in part due to low adoption of input technologies that could improve yields. While a broad consensus agrees that small-scale farmers face many prospective barriers to technology adoption (including lack of information, lack of technical knowledge, risk aversion, liquidity constraints, etc.), there is limited rigorous evidence on the relative effects of these constraints on technology adoption, and on the impact of financial technologies designed to address these barriers.

By simultaneously addressing financial constraints and other constraints to the adoption of improved technologies, a multiple interventions approach have development impact far greater than either of these categories of interventions would have in isolation.

Projects Under Theme C

- *Impact Evaluation of Index Insurance for Small Farmers in the Dominican Republic*
  Michael Carter, University of California Davis
- *Using Index Insurance to Enable to Adoption of More Profitable Agricultural Investments in West Africa (Mali and Burkina Faso)*
  Michael Carter, University of California Davis and Marc Bellemare, Duke University
- *Tailoring Contract Farming to Smallholders in Kenya: Experimental Evidence on Enrollment Impact, Insurance Provision, and Communication Technologies*
  Lorenzo Casaburi, Stanford University
- *Combining technological and institutional innovations for risk management and risk coping by smallholder farmers in Bangladesh*
  Elisabeth Sadoulet, University of California, Berkeley
- *Disseminating Innovative Resources and Technologies to Smallholders in Northern Region, Ghana*
  Chris Udry, Yale University

CLIMATE RESILIENCY AND INDEX INSURANCE FOR SMALLHOLDER FARMERS IN THE DOMINICAN REPUBLIC

Lead Institution	University of California, Davis
Principle Investigator	Michael Carter
Country	Dominican Republic
Mechanism Under Investigation	Index Insurance
Timeline	February 2013 – September 2017
Commodity	Dairy

BACKGROUND

The Dominican Republic consumes 760 million liters of milk in the form of raw milk, dried milk, cheese and other dairy products, and is home to approximately 59,000 producers with approximately 1.2 million heads of cattle. The Northwestern region of the country is a large and poor region with vulnerable population. The average producer owns less than fifty heads of cattle and the average farm size is 2-5 hectares with most of these farms held without a land title. In this region, most farmers (94%) point out the drought as the major risk for cattle operation and milk.

According to 73% of farmers interviewed, 2011 was the regions hardest hit drought causing major economic loses that included death of livestock and low production of milk and dairy; in terms of handling damage, almost 70% of producers have had to borrow its intermediaries to replenish lost cattle and develop prevention initiatives. Available climate change adaptation measures are largely not adopted in this region. Some potential investments for this region include building or fortifying water dams, building irrigation systems of farm modernization, water sources preservation and protection, water storage facilities, massive reforestation plan to balance and counter the increase in temperatures and purchase of high quality supplies and equipment

Despite these risks to this vulnerable population, risk management tools are largely not available. Agricultural index insurance products are not available for dairy farmers in the region. A risk management tool like index insurance could protect farmers from climate risk and enable them to make productive investments in their production and in climate change adaptation.

PROJECT SUMMARY

USAID and partners are implementing a project in the Dominican Republic that aims to offer smallholder dairy farmers the tools they need to cope with climate risk and to improve their livelihoods. The program includes four complementary interventions:

1. *Develop access to climate and weather information*: Several new weather stations are installed in order to give dairy producers better weather predictions so that they can better plan production choices.
2. *Implement "climate smart" agricultural practices*: Demonstration plots that promote the use of risk mitigating technologies (water tanks, dwells, etc.) have been implemented in key areas to help farmers learn about safe production practices.
3. *Increase access to risk transfer mechanisms*: The development of an index insurance product that indemnifies farmers in case of droughts will help them recover after a loss, and also help incentivize them to invest in better technologies that they used to shy away from because they perceived them as too risky.

4. *Increase access to credit for small producers*: In order to invest in improved production technologies, farmers need credit. Using index insurance as a guarantee for lenders, the intervention strives to make loans more affordable to farmers and more secure to lenders.

RESEARCH QUESTIONS & INTENDED IMPACTS

BASIS/I4 researchers have designed a study to estimate the effects of this program. The research team will estimate the impact of index insurance and credit when offered separately or in an interlinked product. In a standalone contract, in the event of a drought or other insured shock, the farmer remains the primary beneficiary of any insurance indemnity that would be paid. In an interlinked contract, the indemnities are first used to repay any outstanding debt, and then the remainder is paid to the farmer (if any remains).

In order to measure the impact of each component of the program (both separately and bundled together), the research team created three groups of farmers in the pilot region. Each group will benefit from a different marketing campaign promoting a specific product. These groups are picked at random from the target population of dairy farmers in the Northwest.

- **Control Group (Group 1):** Farmers in the control group associations are excluded from the program during the first year of implementation. They will be able to join the program the following year. No marketing or educational activities will be conducted in these associations.
- **Standalone Index Insurance (Group 2):** This group is offered the same loan conditions as Group 1 (standard loan conditions), but can buy index insurance as a standalone product. If the demand for credit is higher in Group 2 than in Group 1, this would indicate that index insurance increases the demand for credit. Researchers also anticipate that the loan repayment default rate will be lower in Group 2.
- **Interlinked Contract (Group 3):** In this group, participants will be offered an interlinked product in which any insurance indemnities are first paid to the bank to repay any outstanding debt. The remaining, if any would be given to the farmer to help him recover after his loss. Because default risk is lower in this group, credit conditions can be made more advantageous (lower interest rates). It is possible that the effect of the interlinked product on default rates and demand for credit will be higher than the sum of the standalone index insurance and improved credit supply effects taken separately.

Index insurance and credit can be seen as risky tools for farmers, and they might be reluctant to take on that additional risk. In each treatment group (Groups 2, and 3), the team will conduct educational games and distribute discount coupons that incentivize farmers to buy these financial products. These tools have proven to significantly impact uptake rates in these kinds of programs in the past.

Index insurance is a new product that must be explained to farmers, Farmers will be trained on the use of this new risk management instrument through educational sessions within each treated association. These training sessions are organized as games that mimic production and investment decisions on the farm, and help familiarize farmers with the product. These training sessions can also be seen as marketing activities that present the new products offered by financial partners, increasing its access to potential customers.

Additionally, experience tells researchers that farmers tend to fear new financial products like index insurance. One way to get around this constraint is to offer discount coupons that cut the price of insurance for the first year. Customers tend to test new products more easily if they are offered a discount. In practice, these coupons have been shown to significantly increase take-up rates for insurance products. These discount coupons also help researchers and financial partners estimate the price elasticity of demand for index insurance (or, if the insurance premium decreases by one percent, how much does the demand for insurance increase). This is important for financial partners designing and offering index insurance products.

Some of the questions the research team and partners hope to investigate through this project are the following:

- Do these interventions help farmers break the poverty trap circle by preventing them from selling their assets in case of disaster?
- Does offering farmers index insurance as collateral in case of disaster for their loans help induce farmers to contract loans and invest in new technologies?
- Does the offer of index insurance affect default rates?
- What is the price elasticity of demand for index insurance?

Addressing these research questions will provide important information not only for a potential scale-up of these activities throughout the Dominican Republic, but also for the broader research, financial, and development communities interested in risk management, index insurance, and credit for smallholder farmers worldwide. Results from this study could help to inform project development and product design a variety of locations and for many different commodities.

COLLABORATORS

University of California Davis
Thomas Barre, Post-Doctoral Fellow, I4 Index Insurance Innovation Initiative
Carlos De Los Rios Farfan, Graduate Student Researcher

This research project is a collaborative project that brings together the United States Agency for International Development (USAID), the International Research Institute for Climate and Society (IRI) at Columbia University, Swiss-Re, GuyCarpenter, CaribRM, REDDOM, ADOPEM, Seguros Ban Reservas and BASIS/I4.

USAID has funded this intervention with Fundacion REDDOM as the local implementing partner, with one of their key roles to be delivery of the capacity building trainings to the targeted smallholder farmers. IRI, GuyCarpenter, and CaribRM are all involved in the design and/or monitoring of the selected index and the contract design. Seguros Ban Reservas is the local insurer for the index insurance product, which will be sold by ADOPEM to the farmers. ADOPEM will offer farmers the index insurance product, a credit product, and an interlinked product. SwissRe will provide reinsurance for the index insurance product. BASIS/I4 will conduct a rigorous impact evaluation.

CAPACITY BUILDING

As an essential component of this intervention, the Fundacion REDDOM team will focus on working closely with all collaborators. REDDOM will incorporate their day-to-day implementation of the project with capacity building activities to establish learning objectives tied to their project implementation responsibilities. This will ensure that the REDDOM technical staff becomes one of the primary and direct beneficiaries through implementing, providing training, designing and evaluating all aspects of the program. This participation will strengthen its capacity and readiness to provide such services if program expansion is warranted.

In addition, embedded into the program itself, Dominican farmers will receive training on the financial products offered to them in the course of the program implementation. REDDOM conducted training for farmers on accounting, the importance of risk mitigation strategies, etc. This training was primarily focused on building historical records of activities and incomes for farmers so that they can later access to more affordable loan (the public agriculture bank in the Dominican Republic requires this kind of information as a prerequisite for lending to farmers.)

ACTIVITIES & ACHIEVEMENTS

Last year, a financial partner (ADOPEM) was selected and it will 1) market a standalone index insurance contract for dairy farmers and 2) market an interlinked credit and insurance contract for dairy farmers. A local insurer, Seguros Ban Reserva was also selected, and it will be the insurance institution actually managing the insurance products marketed by ADOPEM.

Over the past year, a lot of efforts have been put into the search for a better index insurance contact that could meet the farmers' and ADOPEM's expectations. These efforts led to deep changes in the design of the index product. The new version is much cheaper than the previous one (perhaps more affordable for clients), offering more value per dollar for the farmers, but these changes also caused many delays. Discussions on the final design of the index insurance product are still ongoing.

These repeated delays and the numerous questions about the product quality pushed BASIS/I4 to initiate, in agreement with USAID, its own investigations into the potential for a better quality contract. BASIS/I4 contracted with a remote sensing company, Vencore, to develop a crop-masking model tailored to the challenges faced in the Dominican Republic. In the Dominican Republic the landscape is often a mosaic of several cover types (trees, grass, cropland, dirt, etc.), making low resolution satellite images noisy. This work is still ongoing but preliminary results show great improvements in the identification of pasture areas, which will turn into a cleaner satellite signal for our index insurance product.

In addition to this investment in more appropriate remote sensing tools, BASIS/I4 launched a series of focus groups intended to help us better understand the costs farmers incur when they face an extremely severe drought. Conversations with local farmers and partners tell us that drought episodes not only reduce milk production. The most important effect is often a dramatic increase in the cost of production. Unfortunately, no data source exists for production costs in the dairy sector.

In order to build knowledge on this issue, BASIS/I4 selected a dozen of dairy farmers' associations for which we could obtain 6-7 years of historical monthly milk production data. A focus group is organized with 5-10 farmers in each association and the conversation is organized around the losses and additional costs incurred during extremely severe drought episodes:

- Quantify losses in milk production

- Quantify additional costs of feed, water, moving cows to wetter conditions, etc.
- Number of cows dying because of the drought
- Number of cows sold in order to feed the rest of the herd

With these new data and improved satellite model in hand, BASIS/I4 will study the feasibility of an improved index product for dairy farmers in the Dominican Republic. The results obtained and methods developed will be communicated to REDDOM so that they will be able to conduct similar analysis on their own in the future.

In addition to the new contract design tasks, BASIS/I4 pursues its impact evaluation tasks and launched a baseline survey in September 2015. The teams of enumerators have been trained to the use of the questionnaire and tablets and the fieldwork will start shortly. Results of this survey are expected by the end of November 2015.

NEXT STEPS

The BASIS/I4 team is also fine tuning a "basis risk game" that intends to help farmers understand basis risk in index insurance contracts. The game was tested in the field in December 2014 with success, and BASIS/I4 is now waiting for the final version of the commercial contract to adjust the parameters of the basis risk game. These games will be conducted in coordination with the marketing activities in order to maximize their impact on farmers' understanding of the commercial product. Hence, the exact plan for these games and the discount coupon distribution will require additional coordination with ADOPEM, and can only be prepared once the final insurance products have been approved by all partners, as well as by the local regulation authorities.

OUTPUTS

The research and implementation team have a preliminary contract, which uses NDVI (from MODIS) data at the municipality level. The group is now discussing with local financial partner to organize the commercial phase of the project.

USING INDEX INSURANCE TO PROMOTE INVESTMENT IN WEST AFRICA'S COTTON INDUSTRY

Lead Institution	University of California, Davis
Principle Investigator	Michael Carter
Country	Burkina Faso
Mechanism Under Investigation	Area Yield Index Insurance
Timeline	2013-2015
Commodity	Cotton

BACKGROUND

Cotton farming in West Africa is a potentially lucrative, but highly risky opportunity for small-scale farmers. Given cotton's high cost of cultivation, as well as it's vulnerability to the region's extreme weather patterns, events such as droughts can be devastating to farmers who risked investment in this opportunity. In response, farmers often limit their exposure to risk by investing less in cotton production than they otherwise might, limiting their yield earnings from this potentially high returning cash crop. In this way, farmers leave money on the table every year. Alternative risk management instruments, such as index insurance, reduce income fluctuations and should increase investment and thus raise farmers' income.

PROJECT SUMMARY

Achieving these index insurance results requires a contract that works, paying farmers when they most need help. The BASIS/I4 research team, led by researchers at the University of California Davis and the University de Namur, designed an innovative multi-scale insurance index that achieves this goal. This multi-scale design minimizes contract failure while still ensuring the integrity of the contract as it limits opportunities for moral hazard.

The team conducted a historical analysis of twelve years of data from nearly 500 village cotton groups in Burkina Faso, and tested how the contract would have performed had these groups been insured. The results show that in years of severe loss, a conventional single scale index would have paid the full insured amount only 30 percent of the time, paid lesser amounts roughly 35 percent of the time, and failed completely the remaining 35 percent of the time. In contrast, the dual strike-point paid correctly 85 percent of the time and failed only 15 percent of the time.

In partnership with private sector implementation partners, the research team will conduct an evaluation of both the efficacy of this contract design and the impact on the wellbeing of the small-scale farmers who purchase the insurance.

RESEARCH QUESTIONS & INTENDED IMPACTS

Context: area-yield insurance for cotton farmers in Burkina Faso

Currently, area-yield insurance for cotton farmers is being piloted in the South-West of Burkina Faso (in the provinces of Balé and Tuy). The insurance was sold in June 2014 and again in June 2015. This is an insurance product designed for groups of cotton producers (GPCs) which protects these groups against yield reductions: the principle is that a payment is triggered when the group's average yield falls below a threshold. An innovation of the insurance design in Mali and Burkina Faso is the use of a double trigger: the insurance is triggered when the group's area yield reaches a certain level AND when the neighboring group's area yields also fall below a (higher) threshold. This double-trigger design allows a large reduction of basis risk and increases demand from farmers for the index-based insurance product.

The main goal of the research project is to study the impact of this insurance in terms of producers' welfare (consumption, wealth, education, etc.) and agricultural decisions (cotton and cereal production, input use, labor allocation, etc.). To do so researchers randomized whether GPCs are offered the insurance or not, and compared outcomes between GPCs to which the insurance was offered on the one hand, and the control GPCs on the other hand. In addition, to better predict insurance demand and improve identification, discount coupons (subsidies) of varying value were randomly distributed to GPCs each year.

A secondary goal is to study the joint-liability credit groups, which these GPCs form. To do so, researchers have already randomized the intensity of monitoring of these groups by the agents managing these groups, for two consecutive years. The research team is analyzing the impact of this increase in external monitoring on internal monitoring inside the group, sanctioning inside the group, and input diversion. This will allow them to better understand the dynamics of these credit groups.

Survey activities

The research sample includes 1,015 households in 80 GPCs in 40 villages. The research team randomized the intervention (insurance sales) at the village level for practical reasons (as it is impossible to offer insurance to one GPC in the village and not to another). Since there are two interventions (insurance and increased monitoring), this creates four cells:

- Insurance and monitoring
- Insurance and no monitoring
- No insurance and monitoring
- No insurance and no monitoring

The monitoring intervention was repeated during the summer of 2014, and the insurance offered in May-June 2014. In the research area in 2014-2015, out of 40 cotton producer groups (GPCs), which were offered insurance, 17 GPCs purchased it (45%). A follow-up survey has been conducted in January-February 2015 to measure the short-term impact of the insurance on households that are part of insured GPCs. This survey also measures the impact of the second monitoring intervention, and has been successfully conducted: 1,011 households were interviewed for a second time. The quality of the data collected is very high, thanks to the use of tablets, field checks and debriefings, and its consistency with the baseline has been reinforced by hiring the same survey team. The insurance was offered to GPCs for a second year in June 2015. The research team is currently planning future data collection to further study insurance demand, ex-ante impact and ex-post effect of the insurance.

Research Questions

1. What are the ex-ante impacts of the insurance product on cotton production, farmer investments, and household welfare?
2. What are the impacts of certain vs. uncertain utility amongst farmers on insurance demand?
3. What are the effects of group monitoring by agents in joint-liability credit groups?

COLLABORATORS

University of Namur
Catherine Guirkinger, Professor
Wouter Gelade, PhD candidate
Elena Serfilippi, PhD candidate

University of California, Davis
Quentin Stoeffler, Post-Doctoral Fellow
Thomas Barré, Post-Doctoral Fellow

Implementation Partners

- Sofitex (the government owned cotton company)
- Ecobank (the largest cotton financer in the country)
- Planet Guarantee (on the ground implementation partner)
- Hanover RE (reinsurer for the insurance product)
- Allianz Bank (financial partner, primary insurer)

CAPACITY BUILDING

Capacity building in this project is occurring through three primary channels:

1. Training for insurance agents/private sector partners.
2. Training for farmers on the financial product offered.
3. Student training as part of the impact evaluation team.

Training for stakeholders is an essential part of this work, and important training is offered to those involved in the marketing, distribution and sales of the product. In addition, through the marketing and promotion activities of implementation partners, cooperatives are trained in the product details through direct meetings in each village. In addition, capacity building is also being conducted for the impact evaluation data collection team, led by Karim PARE. Finally, two students (Wouter Gelade and Elena Serfilippi) from the University of Namur, a research partner on this project, are receiving significant experience and capacity building through their work on the impact evaluation of this intervention.

ACTIVITIES & ACHIEVEMENTS

In 2014, BASIS/I4 researchers worked with PlaNet Guarantee and other partners to expand the coverage area for index insurance in Burkina Faso to the Boromo, Hounde areas

(Hounde cotton Region) and the Dedougou cotton region. This expanded the target population of farmers to approximately 35,000.

Training for stakeholders is essential to the success of this work, especially those who are involved in the marketing, distribution and sales of the insurance product. As such, partners at PlaNet Guarantee conducted training for all stakeholders: The trainings will include Sofitex and UNPCB agents, as well as insurance regulators, and will be conducted with the following goals:

- The regulator understands the product and its benefits and therefore approves the product for sales in the target areas, and
- Sofitex and UNPCB agents are able to train the cooperatives' members and distribute the product properly, including sharing the appropriate information on time.

In addition to the training activities, PlaNet Guarantee also conducted a campaign to raise awareness and promote the product across the target population (at least 35,000 farmers). This has been done directly through the cooperatives and with radio shows for broader promotion.

The insurance sales from the first year pilot were very promising: 45% of the population offered the insurance product purchased it in the first year (out of 2500 farmers targeted). Researchers hope to maintain or increase these numbers in future years. However, the sales figures have been disappointing in the second year, with only 17% of the population purchasing the insurance in the second year, mostly due to implementation issues encountered by our partners on the ground. The research team and the re-insurance company (Hannover RE) are currently working with PlaNet Guarantee to design an improvement plan and overcome these difficulties for the 2016 insurance sales.

KEY FINDINGS & LESSONS LEARNED

As part of this researcher, experiments were conducted in Burkina Faso to examine certain versus uncertain utility. For some people, things that are certain are much more highly valued than something that is uncertain, even if it has a very high probability. Applied to insurance, paying a premium is a negative to farmers, and is certain. On the other hand, an insurance payout, a positive, is uncertain. For farmers with certainty preferences, the certain part (premium payment) is a higher value than the uncertain part (indemnities). Researchers then revised the marketing so that both the premium and indemnity are uncertain, to make them more equal values to the farmer. In a bad year, farmers do not pay the premium, and instead only receive the payout. In this way both premium and payout are uncertain. Researchers discovered that approximately one third of tested farmers prefer certainty. For those farmers, framing the insurance with uncertain premium and uncertain payouts increased willingness to pay by 25 percent. By better understanding the behavioral responses to index insurance, researchers and partners can better design insurance products and marketing mechanisms that generate demand and uptake of these risk-mitigating financial tools among smallholder farmers.

Researchers are currently analyzing the results from the follow-up survey. Preliminary findings on the monitoring effort suggest that the intervention has been effective and had an impact on joint-liability group dynamics.

The impact evaluation analysis has started after data collection and cleaning, and is still ongoing. Preliminary results suggest that the timing of the insurance sales have not allowed farmers to increase their cotton production. However, insured farmers seem to have realized investments in other activities (other cash crops, livestock, field infrastructure, etc.). The research team is conducting further tests to unpack the results and will conduct additional qualitative fieldwork for that purpose. The first results have been presented at the International Conference of Agricultural Economics in Milan (August 2015).

NEXT STEPS

Currently the research team and implementation partners are discussing plans for the next year (meeting in Paris in September). An improvement plan will be designed to avoid the implementation issues that occurred in 2015, and increase the potential impact of the insurance on farmers' investments.

Currently, the steps for the next year include:

- Conduct a small follow-up survey and qualitative fieldwork (January 2016) to better understand farmers' behavior and measure the impact on the insurance (ex-ante, medium-term impact; ex-post on GPCs which received insurance payments).
- Support PlaNet Guarantee with the design and the implementation of the product in 2015-2016.
- Continue analysis of results to date.

OUTPUTS

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Tailoring Contract Farming to Smallholders: Experimental Evidence on Enrollment Impact, Insurance Provision, and Communication

Lead Institution	Stanford University
Principle Investigators	Lorenzo Casaburi
Country	Kenya
Mechanism Under Investigation	Contract Farming, Insurance, ICT
Timeline	1 June 2013 – 30 November 2017
Commodity	Sugarcane

Background

The importance of contract farming schemes in the developing world has been increasing over the last few decades. Improving our understanding of how these schemes can achieve their full potential to improve the livelihood of small producers is thus a particularly timely question. The shift from subsistence to cash crops and from sales at on the spot markets to more complex contractual arrangements is often considered an important driver of structural transformation and growth in the developing world, including Sub-Saharan Africa.

Summary

This research project --- resulting from a long-term partnership between the research team and Mumias Sugar Company (MSC), one of the largest private sector contract farming schemes in East Africa (100,000 smallholders) --- includes randomized controlled trials of a suite of interventions to assess potential impact of such schemes along several dimensions, including farmer income, technology adoption and take-up of insurance products.

Every year, the Mumias Sugar Company targets new farmers for enrollment in the outgrower scheme. This recruitment process consists of a listing of interested farmers in a given location and then in a selection of a subset for inclusion in the scheme. As part of the collaborative research effort, the company has agreed to select the subset of contracting farmers following a randomization protocol. This will provide exogenous variation in farmer-level contract farming status.

Researchers are hoping to shed light on several channels through which participation in contract farming arrangements could affect participating farmers. First, they are studying the impact on overall household agricultural and non-agricultural income. In order to measure profits they are collecting detailed agricultural labor and wage data. Second, the research team will assess the overall extent to which enrollment in the contract farming scheme affects farmer technology adoption. In particular they will measure input usage (e.g. fertilizer) in all the crops cultivated by the farmer. This will allow them to test whether input intensity in crops not targeted by the contract farming, as well as in sugar cane. Third, they will study whether joining the sugar cane contract farming scheme has an impact on food security. There is debate over the impact of a shift to cash crops. Researchers will collect data on food security in order to assess whether there was an impact in this regard.

Fourth, the choice to honor the contract plays a crucial role in ensuring sustainability of the contracting farming arrangement. Researchers will test to which extent the likelihood that the farmer defaults on the contract (i.e., she fails to deliver cane to the company) depends on the

amount of inputs a given farmer is receiving from the company and thus the amount owed at harvest. They will measure heterogeneity of the impact of contract farming along at least three dimensions: i) farmer wealth; ii) gender of the contracting farmer; iii) plot ownership/tenancy status.

Researchers are also exploring innovative insurance products targeting contracting farmers. At the beginning of the agricultural season, credit constraints and myopia may reduce farmer willingness to pay for insurance premiums. However, in the case of contract farming, the company may be able to provide insurance, deducting premiums for repayment at harvest time. Basis risk is another well-known deterrent to take-up of weather insurances and reduces its effectiveness in consumption smoothing. An alternative option is to tie insurance compensation to actual average crop outcomes in the target location. Contract farming companies typically collect precise data on farmer output. MSC also collects information on plot sizes, thus allowing computation of yields. This makes it possible to offer an insurance product based on average yield in a properly defined geographical location, as well as weather.

In addition, researchers are also examining the potential of mobile technology to improve efficiency of communication and interaction along the supply chain. In a large outgrowing scheme like the one under consideration, traveling distances between farmer dwellings and company field offices are often very large and the company extension staff is limited. Information technology --- specifically the diffusion of cell phones among rural populations in the target areas--- presents an opportunity to substantially reduce these communication costs. Researchers plan to evaluate several interventions that allow farmers to report issues in company performance in terms of input provision or that enable the company to ask farmers for feedback about tasks they are required to perform.

Current Activities and Achievements

In this reporting cycle, research implementation has been delayed. Partner MSC has been experiencing significant cash -flow issues in the mid of 2015. A new CEO and a new head of Agriculture were appointed in July and August 2015, respectively. The financial troubles have limited activity development, particular with regard to the recruitment of new farmers. The situation has improved in the last few months as the company secured new loans and appointed new managers. The research team plans to organize a presentation to inform the new management about the joint research projects to be implemented. From March to June 2015, research partners IPA and the Mumias Sugar were still able to pilot the contracting farming recruitment and enrollment design in anticipation of full-scale recruitment evaluation. Although piloting was completed in June; actual recruitment could not commence due to financial issues at the company. Discussions are currently underway with MSC to determine when the recruitment may be able to begin.

Even with these partner-related setbacks, several research advances have been made. The pilot of the hotline query-logging system and interactive SMS scheme were completed. Both services were offered to about 8,000 farmers, a subset of which was included in the randomized evaluation. The research team developed a double trigger area-yield insurance, which the company offered to farmers in the piloting stage. We conducted a randomized controlled trial with around 1,000 farmers contracted with the company. The company offered to all these farmers a double trigger area yield insurance product, where payout occurs if both plot yields and area yields are below a certain threshold of their respective predictions. The analysis of the pilot data on insurance take-up was completed in April 2015. Take-up will also be evaluated during the full-scale insurance

evaluation.

Collaborators and Partnerships

a. **Stanford Institute for Economic Policy Research, Stanford University**
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   - Shoven, John (co-Principal Investigator), Charles R. Schwab Professor of Economics

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   - Kremer, Michael (co-Principal Investigator), Gates Professor of Developing Societies
   - Willis, Jack (co-Principal Investigator), Ph.D. Candidate

c. **Maseno University School of Business and Economics**
   School of Business and Economics
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   · Odondo, Alphonce (co-Principal Investigator), Assistant Lecturer

d. **Mumias Sugar Company (MSC)**
   P.O Box Private Bag, Mumias, Kenya

e. **Innovations for Poverty Action (IPA)**
   P.O. Box 2663-40100, Kisumu, Kenya

Capacity Building

The US-Kenyan research teams have been working closely to design the project and implementation of interventions. Jack Willis and Lorenzo Casaburi, who are based in the US, conducted field visits this year in the months of April and June respectively. During their visits they both held discussions with Alphonce Odondo, the Kenyan-based Principle Investigator on research progress and involvement of Maseno University students on the project.

In March 2015, a short course on program evaluations was conducted at Maseno University for Doctoral students and faculty members from Western Kenyan universities. This course was presented as a full-day workshop with 30 students from the School of Development and Strategic Studies as held at the Maseno University Campus in Kisumu. Two interaction presentations were given by Rachel Steinacher, Research Manager at IPA-Kenya, covering the topics of how to design a research question and an introduction to a variety of impact evaluation strategies and analysis techniques. Participants were then broken into small groups and were led through a series of case studies where they were presented with an evaluation scenario and posed a series of questions to encourage them to think critically about the design and methods being used. The purpose of this training was to build the capacity of Kenyan university students to better understand and engage with evidence presented from impact evaluations.

In addition, a scholarship was provided to Carol Nekesa, a Kenyan national who was employed by Innovations for Poverty Action for several years and served as the Deputy Country Director before leaving to pursue her graduate studies. This scholarship is partially funding her participation in a Masters Degree program at Harvard University's Kennedy School of Government.

Funding was also allocated to six employees of the Mumias Sugar Company, as part of the partner capacity building goal to support company research on challenges and innovations for sugarcane smallholders.

Outputs

A policy brief was presented to Mumias Sugar Company in July 2015. In addition, research presentations were conducted at the:

- International Growth Center Growth Week (9/2014)
- Basis Technical Committee Meeting (11/2014)
- Harvard Development Lunch (11/2014)
- Stanford SIEPR Board Meeting (3/2015)
- Oxford Centre for the Study of African Economies Conference (3/2015)
- Pacific Development Conference (4/2015)

Next Steps

As outlined in a previous section, the Mumias Sugar Company has been experiencing significant cash-flow issues since mid-2015, which led to delays in a number of major project activities. Given the appointment of the new CEO and head of Agriculture, researchers are cautiously optimistic that this situation will improve over the next few months and allow project activities to resume. Researchers have moved the activities that were scheduled to happen in this current reporting cycle into next year's workplan. This includes moving the implementation of the baseline data collection activities for the contract farmer recruitment evaluation and insurance evaluation, as well as the roll-out of the full-scale insurance product. The full-scale contract farmer recruitment and randomized enrollment, the baseline for the contract farming scheme intervention, and the baseline for the Insurance intervention are all planned to begin in the next reporting cycle. Capacity building activities with Maseno University graduate students and implementing partner (Mumias Sugar Company) and dissemination activities will also take place throughout this next reporting period.

Reducing Uninsured Risks for Smallholder Farmers in Bangladesh Through Flexible Financial Products and Technological Innovations

Lead Institution	University of California, Berkeley
Principle Investigator	Elisabeth Sadoulet
Country	Bangladesh
Mechanism Under Investigation	Complementary financial and technological innovations
Timeline	June 2014 – September 2017
Commodity	Rice

Background

Bangladeshi farmers and rural inhabitants are exposed to high production risks due in particular to recurrent floods and droughts. They are also exposed to health and disability risks. These uninsured risks take a heavy toll on welfare, productivity, income, and asset ownership. As a main cause of impoverishment when shocks occur and these risks keep people in chronic poverty due to the high cost of self-insurance.

With high uninsured production risks, crop insurance should have an important role to play. It is well known that indemnity-based crop insurance has proven to be very difficult if not impossible to implement in smallholder agriculture. For this reason, index-based weather insurance has been explored as an appealing risk-transfer instrument. It has however proved difficult to promote among farmers due to incomplete coverage of risk (so-called basis risk), high cost due to insurance company loadings, lack of trust in insurance providers, and lack of willingness to insure as a well-known behavioral trait. While some success stories are starting to emerge they remain limited and usually associated with high subsidies.

A promising hypothesis to make risk-management more accessible is that traditional financial products (transfers, savings, and credit) delivered by micro-finance institutions can be adapted to farmers' and rural inhabitants' demands for risk management and risk coping services. For this, financial products need to be made more flexible, without compromising clients' willingness and ability to save and repay loans. Financial products also need to be made contingent on exposure to verifiable health and weather shocks. Financial products and technological innovations can be combined in optimum risk-handling portfolios of instruments corresponding to the specific types of risks and the specific circumstances under which agents operate.

Project Summary

In this project, researchers will explore, with BRAC and IRRI partners in Bangladesh, how to design and offer a portfolio of risk-handling instruments to smallholder farmers and rural inhabitants. Lessons will be derived from experimentation with index-based weather insurance to develop index-based risk-handling savings and credit instruments. Of additional interest is to combine risk-reducing technological innovations (specifically new drought tolerant rice varieties) with risk-handling financial instruments (specifically flexible dedicated savings and indexed contingent pre-approved lines of credit).

In this collaborative project with BRAC, researchers will explore how risk-reducing technology, motivated and dedicated savings, and indexed pre-approved lines of credit can be combined to provide protection against risk. This project will first use theory to understand the optimal combination of instruments according to sources of risk and types of agents, and empirical analysis to learn from the SafeSave experience in Bangladesh that offered quasi-flexible savings and credit facilities. Researchers will then collaborate with the BRAC microfinance unit in developing an integrated package of technological and financial instruments for risk protection. This will build on existing microfinance products, especially the Good Borrower Loan Program, the Medical Loan Program, and the MFI loan program to Borga tenant farmers. It will also collaborate with IRRI in introducing new drought-resistant rice varieties.

Current Activities and Achievements

This year's activities for the flexible financial product have largely focused on defining and developing the financial product jointly with BRAC, creating a credit scoring system for BRAC clients, and setting up administrative systems necessary for the piloting of the financial project.

In the Fall of 2014, the research team conducted an analysis of BRAC client behavior in response to income shocks from flooding, drought, and exchange rate devaluations. The results show that following several types of large income shocks, BRAC clients actively use financial products but are much more likely to become delinquent borrowers. At the same time, there is some evidence that access to new loans declines in the wake of a shock. These results reinforce the need to adjust current products to be more flexible to improve outcomes for both BRAC and their clients.

In the Winter of 2015, over the course of an extended visit to BRAC Bangladesh in January, the work activities for the development and piloting of flexible financial products were agreed upon. BRAC Bangladesh agreed to devote two of their staff to assisting the implementation of the project and to help incorporate the flexible loan into the BRAC system. The primary activity from January until June was creating a quantitative credit scoring system for BRAC to score its clients. This system was developed by using past BRAC borrower behavior to predict future defaults. After developing the scoring system on a sample of 50 branches, the scoring system was then validated on another sample of 100 branches. This score allows BRAC to better identify "good" borrowers for whom they will extend the flexible financial products and has been demonstrated to be an improvement over previous BRAC attempts to identify "good" borrowers from more simple metrics. The credit score was being developing jointly by BRAC researchers in Dhaka and a Berkeley graduate student.

In June, a Berkeley graduate student returned to BRAC Bangladesh to finalize the details of the financial product and to organize the pilot for product testing. Additionally, there were several field visits to BRAC microfinance branches in order to talk to microfinance clients who had experienced flooding disasters in the past. Their reported experiences revealed that extra capital is widely desired in the aftermath of disasters and that the availability of additional credit from BRAC would have enabled them to avoid more costly coping measures such as selling productive assets or taking expensive short-term loans from local moneylenders.

After extensive discussions with the BRAC microfinance operations department the details of the product were decided upon:

- The initial loan product will be focused on offering extra liquidity to clients after floods. Floods were chosen as the starting point because they are common throughout Bangladesh and are often more damaging than drought during the Aman cropping season.
- Floods will be determined to have occurred for a given BRAC branch based on river height measurements from the Flood Forecast and Warning Center run by the Bangladesh government (ffwc.gov.bd).
- In the event of a flood, a pre-approved loan will be offered to selected BRAC microfinance clients based on the newly developed quantitative scoring system.
- Pre-approved clients will then be eligible to take a loan in addition to any current loan they may have. Clients may borrow until their total debt is equal to 120% of their previously approved loan amount.

Finally, eleven BRAC branches were chosen to participate in the pilot during the 2015 Aman rice-cropping season. Loan materials and software were distributed to the eleven branches in early August and emergency loans are currently being distributed to pre-approved clients in flood-affected areas.

With regard to the flexible loan product, the main results discovered to date show that microfinance clients actively use financial products in the aftermath of income shocks, but that they are much more likely to become delinquent borrowers. This suggests that more flexible financial products could be useful to microfinance clients and the microfinance institution by allowing clients access to needed capital and to maintain their good standing with the institution.

Additionally, anecdotal evidence gathered in June 2015 suggests that extra capital in the aftermath of is widely demanded by microfinance clients. In the opinion of the borrowers, extra capital provided by BRAC would have allowed them to avoid costly coping mechanisms that they had previously used.

In addition to the preparation of the insurance products, the research team was involved with case studies of water use and water market done in Rajshahi, by one graduate student from Berkeley, one BRAC researcher and 2 persons form IRRI. Because of the violence that took place at that time, only 4 villages could be visited in January. Sixteen more village case studies have been done since in March and April by IRRI personnel. The data is now available, but is not yet fully analyzed. The preliminary results show a great diversity in access to complementary water across these districts, suggesting a differential vulnerability to drought.

- The census in the 35 villages that form the pilot took place in May, with basic information on 3680 farmers.
- The selection of farmers was done according to 5 rules (i) median characteristics, (ii) most named as person farmers turn to discuss rice production, (iii) most named as best farmer, and (iv) willing to return the most seed at the end of harvest, and (v) randomly chosen.

- Seed distribution to the top 5 farmers according to each criterion in 7 villages took place early June

Very large flooding in the country has destroyed the crops for 30% of the target farmers. The research will however proceed since this the current activities was meant to be more a proof of concept/pilot that a full size experiment. The research team's next step is a survey after harvest, in January 2016

Collaborators

University of California Berkeley
Alain de Janvry, Professor

BRAC Microfinance
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International Rice Research Institute
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Mohammed Abdul Bari, STRASA Bangladesh

Capacity Building

The research team was involved in several capacity building activities this reporting cycle. Training on how to construct and maintain a client credit scoring was given to the BRAC microfinance research division on July 22, 2015. The purpose of the training was to develop an understanding of basic predictive methods and the necessary steps that are necessary to maintain a functional credit scoring system in a microfinance institution.
Sakib Mahmood, a PhD student at UC Berkeley, led the team in training a BRAC researcher in doing case studies on rice varieties and use of water.
Finally, Gregory Lane, a PhD student at UC Berkeley, was sent to Bangladesh to liaise with BRAC and organize the financial product.

Outputs

Because of the early stage of this project, there have been no print outputs to date. There has been a training session given to BRAC microfinance research team on the creation and maintenance of a client credit scoring system held in Dhaka, Bangladesh July 22, 2015.
The remaining main anticipated outputs are the following:

a) Academic papers that will include a theory paper on the complementarity/ substitutability of savings, flexible credit, and insurance in handling risk; research results on the uptake and benefit of alternative financial products designed for protecting against risk; and research results on the complementarity between stress resistant varieties and financial products.
b) A set of guidelines as to how to combine risk-handling technological and financial instruments to be offered in a microfinance program such as BRAC's for its various categories of MFI clients: progoti, dabi, Borga, and migrants.
c) Dissemination of results to BRAC managers and program personnel. Dissemination of results in a public conference, in particular for the Basis-AMA program.

d) Training of BRAC researchers and UC PhD students

Next Steps

In the next reporting cycle, the main activities relating to the financial products include the completion of the pilot currently underway in Bangladesh and the planning and initiation, in 2016, of a full scale Randomized Control Trial to test the effectiveness of the financial product. Data and results from the pilot program will begin to return from BRAC Bangladesh beginning in November 2015. Once sufficient data from the pilot branches has been collected, the project team will analyze the data and make any adjustments to the design of the financial product deemed necessary based on the results. The full scale RCT will then be planned and launched to coincide with the beginning on the Aman planting season in late May 2015. The RCT will involve the roll-out of the emergency loan product to a random selection of branches and significant data collection efforts to capture the impacts of the loan product on client decision making.

With respect to the technology product, the purpose of the full size experiment will be to establish the best mechanism through which farmers will experiment and learn about the benefits of the new seeds. The researchers consider this as a pre-requisite to understanding adoption and impact of the new technology. In order to do this, a post-harvest survey of the pilot experiment will be executed in January-February 2016. The delineation of the full size experiment to be implemented next summer season still needs to be established with the hope that the distribution of the drought resistant seeds can in May 2016.

The researchers plan to prepare at least one academic paper based on the results from financial product RCT, and one paper based on the combination of data from the pilot program and historical data on microfinance clients' behavior in the aftermath of income shocks. Presentations will be made in Bangladesh on results from the pilot in January 2016 and on the results of the full-scale RCT in late 2016. Policy briefs and short summaries will be prepared corresponding to each paper for dissemination to our institutional partners in Bangladesh and other interested parties.

Disseminating Innovative Resources and Technologies to Smallholders (DIRTS) in Northern Region, Ghana

Lead Institution	Yale University
Principle Investigator	Chris Udry
Country	Ghana
Mechanism Under Investigation	Index Insurance and Technology Adoption
Timeline	January 2013 – Dec 2016
Commodity	Maize

Background

In Ghana's Northern Region, smallholder farmers cultivate rain-fed crops, face significant risk of weather shocks, chronically underinvest in input technologies, achieve just a fraction of potential yields, maintain limited liquid savings and are often food insecure. Smallholder farmers chronically under-invest in farm technologies, including organic and inorganic fertilizer, high-yield seeds and farming equipment. Recent work estimates that farmers in northern Ghana are achieving just 30 percent of potential crop yields. Most farmers in northern Ghana apply low levels of inputs per acre, despite documented extraordinarily high returns.

Two sets of study findings on agricultural investment motivate DIRTS project in Ghana. First, a current project underway in northern Ghana since 2008 has shown a dramatic response of farm investment to rainfall index insurance, in the form of increased cultivation, land preparation, chemical input purchases and household labor. There is strong demand for rainfall index insurance: more than two-thirds of farmers purchased insurance at commercial prices. However, there was no evidence of corresponding technological transformation, intensification or high returns to these additional investments. In other words, increased investment did not lead to significantly higher farm profits. Second, another ongoing project has demonstrated that technologies and agricultural practices exist that dramatically increase profits on test plots on farmers' fields. Specifically, that project shows that intensified application of both organic and inorganic fertilizer is highly profitable. The DIRTS project combines these two ideas: improving rural access to innovative financial markets in order to provide a less risky environment for farmer investment, while also providing complementary access to extension advice and input technologies with potential to translate investments into improved per-acre production and profits.

Project Summary

DIRTS will provide an integrated examination of three barriers to the adoption of apparently highly profitable fertilizer/seed technology by smallholders in Ghana. First, to test the importance of imperfect farmer knowledge of farming best practices, randomly selected communities will be provided with more intensive extension through a Community Extension Agent (CEA), a community member who will be trained to use Android phone extension applications as a supplement to existing government extension services. Second, to test the importance of unsure, untimely and costly access to appropriate inputs, DIRTS will make commercial inorganic fertilizer and improved seed available just prior to land preparation at varying prices in a community. Third, farmers will be able to purchase a commercial rainfall index insurance product at individually varying prices. This design will allow study investigators to identify specific barriers that stand between insured farmers and increased productivity.

Input treatment design: Prior to land preparation, randomly selected communities will receive an opportunity to purchase commercial inorganic fertilizers and improved maize seed that will be delivered to farmers ahead of planting time. Inputs will be sold at varying prices, randomized at the community level—at two initially low prices, and at increased prices during the second year—to allow investigators to provide insight into the profit potential for value chain actors in the region. At harvest of the first year of the study, when most farmers have cash on hand, farmers will have the option to purchase vouchers for commercial inorganic fertilizer, to be redeemed at the time of land preparation the following year.

Extension treatment design: Communities receiving the intensive monitoring and extension treatment will be visited for interactive, group-level trainings on farming best practices conducted by MoFA employed agricultural extension agents (AEAs). This is the standard practice of communities receiving extension services from MoFA. In addition, IPA, MoFA and SARI will train Community Extension Agents (CEA) to supplement AEA training sessions and farmer monitoring responsibilities in these communities. Residents of the community, CEAs will be compensated per farmer interaction. CEAs will visit randomly selected farmers weekly to provide supplementary assistance or trainings on field selection, land clearing and preparation, creation and application of organic matter, seed varieties, planting methodology, application of organic and inorganic fertilizers, weeding and field maintenance. Together, the AEAs and CEAs will provide a full package of training, including advice on optimal timing of key farming activities in the growing season.

Insurance treatment design: Outside pure control communities, farmers will have the opportunity to purchase rainfall index insurance at individually randomized prices. This is a commercially viable drought index insurance product, designed by the Ghana Agricultural Insurance Programme (GAIP). The insurance product will be offered to all farmers living in randomly selected DIRTS communities, at either a fair-market or subsidized premium, and will be available for purchase at an individual level. Randomly varying the premium will allow investigators to further demonstrate the robustness of the insurance demand curve and explore how insurance price and take-up interacts with other treatment. The design will also allow investigators to measure the role of social networking in take-up.

Current Activities and Achievements

The latest survey launched was the Labor Survey, a longitudinal data collection exercise, with biweekly frequency, that will last from the beginning (April) to the projected end (October) of the rainy season, covering the entire study sample (3236 households). The purpose of this survey is to collect sufficient data to substantiate more detailed exploration of the role of labor costs in the overall context of agricultural investment decisions and new technologies adoption. The survey starts with questions about the agricultural activities the household has been engaged in during the past two weeks (clearing plots, ploughing, planting, applying chemicals, weeding, harvesting), as well as a few details regarding how the activities had been carried out. Then for each type of labor (self, household member, communal member, hired labor, additional labor), the Community Survey Assistants (CSAs) ask for the following information: the number of male laborers of this type, the number of female laborers of this type, the total number of days the male laborers have worked, the total number of days the female laborers have worked, and the average time this type of laborer has worked.

Sales of the insurance policy were expected to be negatively impacted in this year, due to the fact that no payouts were received in the previous year, but sales still managed to nearly double last

year's figure with around 800 farmers in the DIRTS community insured for an area of 1,070 acres. These sales may have been supported by the "video van" that showed a video drama on the decision of whether or not to buy a drought insurance policy, which was enthusiastically received by the targeted communities. Researchers look forward to continued analysis as to whether this protection against weather (drought) risk impacts farmers' decisions, in particular how much land they cultivate, what inputs/techniques they use, etc. Community extension work has continued, as well. Since the start of these activities, extension workers have delivered a total of 8,348 maize extension messages and 3,11 legume messages.

Preliminary analysis of the first three rounds of data has shown that the most popular forms of labor are self-labor and the use of household members. As expected, barely any farmers have engaged in harvesting and applying chemicals, while around 80% of the respondents have been preparing land for planting during the past period.

In addition, in the past year the project has seen some positive influence over policy. After seeing CEA in action in 2014, the Mion District Office of the Department of Agriculture, the local government body in charge of administering resources and policy making at the District level in the agriculture sector, expressed the wish of replicating the CEA model in a handful of communities outside of the DIRTS sample. The Pilot was organized by the Mion District Director in cooperation with the DIRTS team.

Collaborators

International Food Policy Research Institute (IFPRI)
Shashidhara Kolavalli, Senior Research Fellow

Savannah Agricultural Research Institute (SARI)
Mathias Fosu, Senior Research Scientist

Yale University
Dean Karlan, Professor of Economics

Capacity Building

Nearly 125 qualified applicants were invited for enumeration training in February and March of this year. The training topics included an Introduction to IPA, IPA survey protocols, Data collection ethics and best practices and teaching of the questionnaire itself. The processes included a lead facilitation where the Survey Coordinator and Field Manager led Power Point Presentations; the lead presentations were done by questionnaire models after which the trainees were divided into groups of 10 led by experienced Team Leaders and Field Supervisors to study the questionnaire in detail. This was then followed by a role-play session where trainees administered the questionnaire to each other to have a first-hand feel of the process. This process in interlaced with tests on IPA Survey Protocols, data collection ethics and the questionnaire to assess comprehension level of trainees and capped with a field pilot of the questionnaire where the trainees visit a non-sample community to mimic a real day of survey data collection. To ensure accuracy in data collection, participants were also taken through some technical skills training to improve their working knowledge and skills with the computer. The goals and objectives of the training were to empower the participants with the required knowledge and skills to be able to carry out the survey, to

understand the questions in the survey and how to administer them in the right manner. The participants who performed creditably and distinguished themselves were selected after the training to carry out the survey.

In March 2015, over 160 people were picked to attend a workshop and receive training to equip the participants to independently collect data on labor activities as they are happening in the field. The training was known as CSA Plot measurement training. This training was done to teach the Community Survey Assistants on data collection with the use of the Global Positioning System (GPS). They were trained in groups for a period of two days. They embark on field practice surveys by measuring at least one plot. They were also retrained on surveys topics such as logical inconsistencies, missing surveys, and survey durations.

OUTPUTS

Disseminating Innovative Resources & Technologies to Smallholders: Newsletter. IPA. July-December 2014.

Disseminating Innovative Resources & Technologies to Smallholders: Newsletter. IPA. January – March 2015.

Disseminating Innovative Resources & Technologies to Smallholders: Community Extension Agents Update. IPA. April & May 2015.

Disseminating Innovative Resources & Technologies to Smallholders: Newsletter. IPA. April – June 2015.

Disseminating Innovative Resources & Technologies to Smallholders: Community Extension Agents Update. IPA. June 2015.

Disseminating Innovative Resources & Technologies to Smallholders: Community Extension Agents Update. IPA. July 2015.

Next Steps

In the next reporting cycle, the research team will be concentrating on the following activities:

In the next year, researchers will continue data cleaning and analysis of the Knowledge and Practice Survey (KPS). Researchers will resume preparations for next year's survey, including finance and operations planning as well as updating the collection instrument. In addition the research team will conduct the annual survey. The will focus on extraction and cleaning of the market survey data (a component of the larger annual survey), as well as to proceed with the data cleaning and analysis of the main annual survey data and preparations for dissemination.

Researchers will continue collecting the biweekly rounds of the Community Survey Assistant (CSA) labor survey, including the monitoring and evaluation of survey operations and data cleaning. The research team will develop and implement an integrated M&E and data

management framework, and resume the measurement of the 12,117 plots in DIRTS sample, which will be done in 3 phases spamming a total period of three months.

Finally, the research team will conduct capacity building activities through events to develop the skills of field staff and data management training for senior staff.

RESEARCH THEME D: IMPROVING MARKET ACCESS FOR INCLUSIVE AGRICULTURAL GROWTH

Markets in developing countries are often plagued by poor integration. Smallholders often face isolation, which can have a major effect on both farmer incomes and food security. While poor infrastructure often gets the blame for poor market integration, it is likely that it is due to imperfect information.

Projects Under Theme D

- *Communication, Search, and Mobile Phones: A Telephone Directory Intervention in Tanzania*
  Brian Dillon, University of Washington
- *Building Market Linkages for Smallholders in Uganda*
  Craig Mcintosh, University of California, San Diego

Communication, Search and Mobile Phones: A Telephone Directory Intervention in Tanzania

Lead Institution	University of Washington
Principle Investigators	Brian Dillon
Country	Tanzania (Dodoma region)
Mechanism Under Investigation	Telephone directory
Timeline	1 June 2014 – 31 May 2015
Commodity	Non-specific

Background

The expansion of information and communications technology (ICT) throughout the developing world is among the most profound and all-encompassing instances of technological change in modern economic history. In the 15 years since mobile phone towers first arrived to rural areas of low-income countries, researchers and policymakers have recognized the potential for ICT to improve service delivery and increase market participation by agrarian households.

Yet, for all the promise of this technological transformation, our understanding of the economic significance of these changes remains surprisingly rudimentary. This is particularly the case regarding the potential for ICT to provide pathways out of rural poverty for agrarian households. One particular mechanism that is poorly understood is the extent to which ICTs create private returns for smallholders by lowering the costs of both communicating with and searching for suppliers to their agricultural production functions and buyers of agricultural outputs.

While it is commonly believed that a major impediment to smallholder productivity is the underutilization of key inputs, few practical solutions exist to improve communications between farmers and from farmers to suppliers and traders. Mobile phone technology has enormous potential to increase market participation and use of improved inputs by linking previously disconnected households to large networks of agents with whom they can interact at low cost.

Project Summary

In developing countries, individuals' mobile phone networks are predominately functions of their face-to-face networks. Phones reduce communication costs between linked agents who purchase phones and exchange numbers, but they do not significantly alter the costs of searching for new contacts.

In this proof-of-concept study, researchers will measure the extent to which an information tool that lowers the cost to households of searching for firms relevant to agricultural production can increase communication between households and firms. The primary intervention is a telephone directory that lists descriptions and contact information for enterprises in the surrounding area, which researchers will construct and distribute to agrarian households in Tanzania.

The primary objective of this preliminary study is to measure the effects of the telephone directory on the firms that are listed. Researchers will track a range of firm outcomes, including number of employees, revenues, and profits, as well as the intermediate mechanisms by which those outcomes are realized, such as number of customers, number of phone calls received, inventories, trading

volumes, location of activities, and prices. Researchers will use a randomized, controlled trial with variation in the intensity of firm exposure to households.

Collaborators

Institute of Rural Development Planning (IRDP), Dodoma, Tanzania
Adalbertus Kamanzi, Research Fellow

Tufts University
Jenny Aker, Assistant Professor, The Fletcher School

University of Washington
Joshua Blumenstock, Assistant Professor, Information School

Current Activities and Achievements

In this current reporting cycle, researchers were busy ramping up survey activities and working on telephone directory distribution. At the beginning of the reporting cycle, researchers conducted a baseline survey with 440 of the 1,495 census firms (i.e., the firms that enrolled in the directory project). Next they cleaned the census data, type set, and printed the telephone directory. By December 2014 and January 2015 researchers were ready to distribute the directory to households. Distribution took place through community meetings at which researchers explained the usage and purpose of the directory, and answered questions. In February 2015, the team developed and piloted a midline survey with firms, which was implemented from March-May 2015. In May and June 2015 two short follow-up phone surveys were conducted with firms, focusing only on the most important outcome (the number of incoming phone calls). From July through early September of 2015 the research team conducted a survey with approximately 800 households in the study area, including those in both treated and non-treated villages. During this period the second version of the directory was printed, which includes all census firms. As of October 2015, the team is in the second full week of the endline survey with firms. The goal with this survey is to interview 940 firms – the 440 baseline firms, plus an additional 500 firms. The size of the target sample at endline has been increased in order to maximize power during our final opportunity to assess firm outcomes.

To summarize, since June 1, 2014 researchers have completed 5 rounds of firm survey activities, with a 6th round ongoing, with an expected final total of 4950 contacts with firm owners or managers. In addition 800 household surveys were completed. The Team also printed and distributed 3,280 first round directories, and have printed 7,700 second round directories with distribution pending.

The research project accomplishments this reporting cycle included an initial analysis of the midline firm survey data. The treatment effect on the nine main survey outcomes was positive in all cases, though only statistically significant in one. Researchers have not yet had staff time to analyze the firm phone survey data or the household survey data, and the endline data is still being collected. What is known, from an initial look at the household survey data, is that approximately 28% of treated households made use of the directory. This includes respondents who live in a handful of villages without a mobile network signal, so the usage rate among those with a reliable phone signal is higher.

Capacity Building

The researchers have included on the enumeration team nine different Tanzanian students or recent graduates, though never more than eight at one time, as well as one lecturer who is considering PhD studies. The only unanticipated change regarding capacity building is that all of the staff members who were students at the time of hiring have completed their coursework. Three of our current enumerators are awaiting the final results of their undergraduate exams; the others have completed their undergraduate or Master's studies. The researchers have provided training to all enumerators in research design, survey techniques, and use of the SurveyBe software. Two team members have received additional training on Stata.

All team members have been involved in piloting, commenting on, and finalizing all of the surveys. Four of the enumerators are interested in possible research careers, and researchers have been especially attentive about informing these team members of the key decisions faced by the investigators and engaging them in design decisions. In addition, researchers have provided training and guidance to three RAs from investigator institutions –Jessica Rudder and Audrey Lawrence, MPA students at the University of Washington, and Grant Bridgman, MPP student at Tufts University – in all aspects of survey design and implementation, including budgeting, staff training, experiment design, questionnaire design, survey programming, data cleaning, and field team management. Rudder and Lawrence also developed SurveyBe programming skills by reading manuals and communicating with SurveyBe support staff.

Outputs

The research team has not yet produced any outputs, as they are still in the early stages of data collection.

Next Steps

The main activities in the next reporting cycle include data cleaning and analysis once the endline survey as been completed. In addition, new collaborations and local partnerships are underway with the three largest mobile phone companies in the study area. These companies have indicated a willingness to cooperate in a variety of ways – data sharing by Vzodacom, aggregate analyses by Tigo, and potential release of records by Airtel. The expectation is that researchers can formalize linkages with these companies in the coming months.

Researchers hope through this study to establish proof-of-concept for telephone directories, and that a sufficient sample size and interesting preliminary results will merit publication of an academic paper and a policy report. If results merit, researchers will use the findings of this study to apply for additional funding to conduct a larger study in which they investigate study outcomes for both firms listed in the directory and the households that receive it.

Ewarehousing for Smallholder Farmers in Uganda

Lead Institution	University of California, San Diego
Principle Investigator	Craig McIntosh
Country	Uganda
Mechanism Under Investigation	Contracting and Information Technologies
Timeline	October 2014-September 2017
Commodity	

Background

In the face of growing food demand from a burgeoning population, East African grain markets are plagued by poor integration. The symptoms of shallow markets can be seen across space as well as across time, which can lead to highly variable prices that disadvantage farmers. In addition, given the inability of markets to efficiently move food from surplus to deficit regions, this poor integration has a major effect on both farmer incomes and on food security. Output market inefficiencies prevent smallholder farmers from connecting with large buyers, resulting in fragmented supply chains and isolated markets susceptible to localized shocks. These inefficiencies are a product of high transaction costs: search costs, distance, poor infrastructure and information asymmetries between buyers and sellers. As harvest levels vary across seasons, buyers must continually update their information on the quantity and quality available for sale in the many villages from which they would like to buy. To collect this information, buyers must physically visit the villages themselves or build relationships with representatives from each village whom they can call; both search strategies are costly.

Contractual risk may also dampen buyers' willingness to engage in trade with remote villages. Buyers must make up-front investments in transportation out to rural villages without guarantees that any agreements made in advance regarding quantity or quality of available crops will be carried out as promised once they arrive. This makes trading in remote villages a risky proposition for buyers, as they must bear the transportation costs for an uncertain return. As a result of these risks and expenses that diminish access to trade networks, smallholder farmers must accept whatever price is available locally. At a market level, rural villages remain poorly integrated and prices vary widely across local markets. Increased competition among buyers and shorter supply chains would improve the price received by individual smallholders, as well as reduce price dispersion across markets.

Given the role that transaction costs play in discouraging trade, it is not surprising that they have negative effects on production, with yields dropping as farms are farther away from large buyers across comparable agro-ecological areas. On the other hand, using information technologies to reduce transaction costs has been shown to relax output market inefficiencies. Much less is known, however, about other major transaction costs that hamper agricultural market efficiency, such as contractual risk and limited credible information about quality and quantity. Relaxing these market constraints, by offering services and technologies specifically designed to link farmers and buyers, could generate further improvements in supply chain efficiency.

Finally, farmers may also face challenges that inhibit their ability to engage in efficient temporal arbitrage, including limited access to storage technologies or to the financial inputs required to make storage palatable to agricultural households. Like many agricultural markets across sub-Saharan Africa, most Ugandan crop markets feature large seasonal price fluctuations, as urgent

household needs force farmers to sell their produce immediately after harvest, flooding the market. Access to credit, which could fill this gap by allowing farmers to store part of their crop until prices are more favorable, is low in rural areas and is rarely specifically tailored to rural residents' needs. In addition, what crops farmers do store are typically stored in their homes in the most basic conditions that do not feature the necessary airflow and pest containment required for long-term storage. Improved access to credit and storage facilities could improve farmers' ability to engage in temporal arbitrage and, ultimately, improve the seasonal price fluctuations that characterize African grain markets.

Project Summary

The study will bring together three institutions to implement an intervention that aims to

1. improve the information available to farmers and brokers across the country;
2. engage a novel technology to offer a completely new vehicle through which long-distance agricultural transactions might be conducted; and
3. provide the reputational and financial guarantees that may enable this new system to thrive.

This project is a multi-pronged intervention that aims to build sustainable, private-sector solutions to some of the intermediation issues that have plagued African food markets. The three prongs of the study work to simultaneously alter the intermediaries, the information, and the contracting options available in food markets. First, researchers have teamed with AgriNet, the major private-sector supply chain company in Uganda to implement a randomized expansion of their Commission Agents model to 220 new communities across 15 districts of the country. Secondly, the research team is working with IPA to implement a high-frequency market price survey using innovative SMS-based tools developed specifically for the project, capturing biweekly prices for the three major food crops (maize, beans, and rice) in 260 markets across the study area and then feeding these prices back to traders and farmers in treatment areas via an SMS subscription service. Thirdly, a close relationship has been cultivated with Kudu, a digital food trading platform developed by computer scientists at Makerere University that allows farmer groups to contract directly with major buyers, using a distance- and price-based matching algorithm to provide Pareto-optimal market contracts to both sides of the market. With this multifaceted approach, the researchers hope to protect the food security of consumers (who face expensive or unavailable grain supplies during the lean season), as well as to promote more integrated markets, with smoother food supply across seasons and improved livelihoods for smallholder farmers.

There are several distinct dimensions in which this project offers concrete potential for scale-up. First, by demonstrating that a high-tech approach to market intermediation can be effective researchers are working at the nexus of technological innovation and information economics to pioneer novel solutions to age-old problems of intermediation. By collaborating with the leading private-sector agricultural broker in Uganda, researchers have a partner who is willing and able to bring the product to scale. The Kudu platform can be scaled up very cheaply, and it is a market whose efficiency should improve as it deepens with greater use.

It is the intention of this study to shed light on broader issues of agricultural output market development. Geographic fragmentation and poor integration of smallholder farmers into the supply chain has long been known to characterize these markets; however, this study will provide novel evidence on the ability of an information and coordination technology to integrate markets. Such evidence will be relevant for development practitioners and policymakers interested in identifying concrete programs that can promote broader market development.

CURRENT ACTIVITIES AND ACHIEVEMENTS

In this reporting cycle, researchers have managed to field all the planned components of the complex and multi-faceted project, some of which have worked well and some of which are underperforming expectations. Researchers remain committed to iterating the design of the technological innovations through each of the four seasons of the project to get the mixture right. Following is a discussion of each of these current activities in turn.

1. Study Sample Definition and Baseline Survey Activities:

The first half of the year was spent in identifying the areas to be covered by the study, nailing down the exact market locations at which price data was to be collected and that would serve as Primary Sampling Units for the study, and then on conducting two very large baseline surveys (one covering traders, and one covering farming households). The E-warehousing team spent nine weeks of Q2 in the field conducting baseline household and trader surveys across eleven districts of Uganda, concluding the exercise with over 4,500 surveys collected. Throughout data collection, the implementing partner AgriNet, launched regional Commission Agent trainings in preparation of the intervention, beginning in Iganga, before moving to Lira, Kasese, Hoima, Mubende and finishing in Budaka in mid- June.

While in the field, the E-warehousing team focused attention on the piloting, recruitment and training of Market Data Enumerators (MDE)—local residents of the study trading centers with the willingness and reliability to conduct a short survey once every two weeks on study crop prices and other features of the trading center. The information gathered from MDEs over the course of two years will serve dual purposes. First, to understand price variations across markets, and second, to be aggregated and shared with farmers, commission agents and buyers in the treatment areas. To control for contamination and spillover effects, 24 untreated trading centers, adjacent to the study districts, were included in the MDE recruitment. A set of critically important national markets were drawn in (either very large domestic trading centers, or the key border markets through which grain is exported to Kenya, South Sudan, and the DRC). There are now 280 markets in which MDEs have been enlisted in total.

2. SMS-based Data Loops:

The SMS consultant, hired to prepare, install and launch the study's Market Price Survey software and SMS Blast System, continued with prototype testing throughout the quarter. The E-warehousing team procured a standalone server to enable real-time testing with computer engineers from CalIT2 at UCSD. After several resolvable issues, researchers are now reliably collecting biweekly data on 271 of our 280 markets, and plan to transition to the SMS-based system in October once the frenzy of the current harvest season has calmed down. The SMS consultants have successfully developed the SMS blast system, which has now sent out over 100,000 messages to farmers. There are five information types in the SMS Blast system that are sent out on a weekly or bi-weekly basis, all providing farmers with essential and detailed price information.

This Market Survey data, combined with transaction data from Kudu, serves as the source for the price information sent out through the SMS Blast system. IPA hired a new RA to develop this protocol and manage the data flow between Kudu, AgriNet and IPA. He has so far successfully setup a data cleaning and data flow process for both the high frequency market survey checks and the SMS Blast System data.

3. Kudu:

Researchers have worked extensively with Kudu to alter the platform for the purposes of the project. This has included changing the matching algorithm, altering the messages that are sent out to buyers and sellers as they match, and creating dashboards that allow AgriNet to use the system for novel purposes such as bulking together small sales lots into aggregated lots. Kudu has been very responsive to project needs and has been an excellent partner so far. Both Kudu and AgriNet have been actively engaged in the difficult process of buyer recruitment for the system.

4. Buyer Guarantees:

Using a grant from IGC/DFID, researchers have set up a randomized system through which buyers matched through the Kudu system are randomly assigned to one of three 'Transport Guarantee' treatment statuses: None, Basic Guarantee (buyer insured against the possibility that the quantity of the sale is not what was represented, and they are reimbursed for travel costs using a pre-set formula based on the location of buyer and seller), or Comprehensive Guarantee (buyer insured against quality, timing, or quantity not being as represented, compensation as above). Since one of the obvious barriers to the use of an anonymous, digital trading platform in an environment where personal relationships typically dominate trade is that there is not sufficient trust in the system, these guarantees allow us to isolate the extent to which these specific forms of contractual risk may serve as obstacles to trade. This randomization is physically executed within the Kudu software platform as bids and asks are matched.

5. AgriNet

AgriNet has successfully recruited, trained, and certified 161 Commission Agents who are located in the 55 treatment sub-counties that make up the intervention area for the study, along with 11 Network Managers who oversee their operations. RAs and PIs continued to formalize the transaction and buyer guarantee protocol through meetings with the partners, which will be randomly available to a subset of bids through the Kudu system. A refresher training of AgriNet Network Managers was held in Kampala at the end of June, before the launch of the pilot of the intervention in July. Training focused on guarantee and cash-on-bag specifics and provided an opportunity to equip Network Managers with a manual and recordkeeping forms for Commission Agents and themselves.

Despite successfully fielding all of the component parts of the project in our first harvest season, the researchers have not been successful in executing sufficient sales through the platform. A few, but not all of the problematic issues that researchers are working to remedy are:

1. It has proven much easier to recruit sellers into the system than buyers. In general the Kampala-based buyers who are willing to transport from the rural areas are sending very large vehicles and are only interested in buying lots of 10 tons and up. Few sellers can bulk these kinds of quantities in advance.
2. The system tends to draw in asks from a large number of very small sellers (1-2 tons), while the bids from the buyers are typically for quantities of 10 tons and up, without which they do not want to send vehicles to the field.
3. The most fundamental problem we face at the moment is that the prices posted by buyers are typically about 20% lower than the prices posted by sellers.

The research team has been addressing and producing solutions to these design complications The current harvest season is coming to a close and researchers anticipate about another month of active sales in this season during which they will try to get the blend of product features right. The team will then engage in a more fundamental reworking of the system prior to the beginning of the next harvest season in late November.

Collaborators and Partners

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Lauren Falcao, Graduate Student, Department of Economics

Makarere University
Richard Ssekibuule, Lecturer, College of Computing and Informatics Technology

Innovations for Poverty Action
Sadat Ntume, Consultant

Capacity Building

Throughout data collection process underway this reporting cycle, the implementing partner AgriNet, launched regional Commission Agent trainings in preparation of the intervention, beginning in Iganga, before moving to Lira, Kasese, Hoima, Mubende and finishing in Budaka in mid- June. RAs presented at each training on the IPA partnership while a Kudu representative co-presented on the mechanics of the Kudu system and created take-away placards to serve as visual reminders to Commission Agents throughout the season. Commission Agents who had dropped out before the launch of the pilot in July were replaced and trained as well.

While in the field, the E-warehousing team focused attention on the piloting, recruitment and training of Market Data Enumerators (MDE)—local residents of the study trading centers with the willingness and reliability to conduct a short survey once every two weeks on study crop prices and other features of the trading center.

In addition, IPA internships offered experience with survey design, data cleaning, and data management. The two interns worked closely with the field RAs to perform a variety of tasks including, but not limited to: data management, cleaning of data sets, organizing baseline data, data analysis, writing instruments and programming. They also had a chance to discuss the projects intellectual aims in greater detail during a PI visit to the field. Our two interns were recent graduates from China and Madagascar.

A Fellowship has been offered to a new student research assistant working with the Kudu team through Makerere. This student is getting on-the-job learning experiences in both backend coding skills and user-facing interface development. On the backend side, Richard Ssekebuule, of Makerere University, is training him. On the user-facing side and research side, IPA staff are giving him training and mentorship as he is learning how to hold focus groups and participate in trainings. This fellowship recipient is a student from Uganda (currently studying at Makerere).

Given the hectic nature of getting this project up and running and the slow pace of budgeting at Makerere University, researchers were unable to host the previously planned Impact Evaluation Workshop in Year 1. This workshop will instead be held during the Summer of 2016 at Makerere University, and will bring together stakeholders from the project, the USAID Mission in Uganda, and others from the research and NGO community. The goal of the workshop will be to build the capacity to conduct rigorous impact evaluations at the agriculture/technology nexus in Uganda.

Outputs

The project has a pre-analysis plan that has been submitted to the American Economic Association Journal. In addition, within 6 months researchers will release a software platform for implementing SMS-based surveys of market traders. It will be a publicly shared version of the SMS software tool publicly posted and clearly branded as a USAID product (it has been co-funded by the Development Impact Lab under HESN).

Next Steps

Nest years reporting cycle will constitute the second and third harvest seasons of what is intended as a two year, four season intervention. E-warehousing will continue with its intervention while trading continues, and continue to recruit buyers to join the system and encourage CAs and buyers to use Kudu. Further, the project will prepare for the next harvest season expected to start in December 2015. AgriNet Network Managers will continue to monitor and develop their network of Commission Agents, with IPA conducting random spot-checks of both Commission Agents and MDEs. On the technology side, the Market Price Survey software will be piloted and rolled out, and the SMS Blast system will continue to send out price information to farmers, traders, Commission Agents and buyers in the treatment areas, while price information will continue to be collected on a bi-weekly basis in 280 trading centers across the country. During the course of October 2015 the current, voice-driven phone Market Survey will segue to the anticipated SMS-based interface.

Given this rich array of institutional data and the huge expense of conducting a full-scale trader survey and household survey follow-up, researchers are trying to optimize data collection resources. Essentially, resources will not be expended to conduct expensive field surveys until researchers have seen, using the institutional data, that an impact on the ground is possible.

For the overall experiment, this indicates that it is not worth conducting panel follow-up surveys of traders and farmers until a substantial flow of trade move through the system, and potentially until impacts on local-level prices using the Market Surveys are seen. Therefore the research team is waiting to conduct a midline survey depending on the progress of the overall intervention at that point.

Besides the overall experimental comparison between intervention and non-intervention markets, researchers are planning have a number of sub-experiments:

- Transport guarantees: the outcome for this study is entirely from institutional data (probability of contract completion, prices, who arranges transport, and a set of other outcomes for which we have established a paper trail inside AN). Therefore no surveys are required to track the impact of this intervention.
- SMS Blast experiments, particularly the Random Blast, can be tracked using only the data from the Market Survey.
- COB credit to traders: this experiment will test the impact of relaxing credit constraints on the volume of business done by intermediaries, the kinds of trades they conduct, their profits, and potentially also local prices. If we are successful in moving a substantial amount of COB credit in the upcoming month then we will conduct a short midline survey only with AgriNet CAs (that is, not with other traders and not with anyone in the control subcounties) in late October and early November.

RESEARCH THEME E: NATURAL RESOURCE MANAGEMENT

Improved natural resources management in developing countries promotes food security and environmental sustainability. Despite increasing evidence that improved natural resource management can lead to better economic outcomes and higher quality of life for participants in developing countries, many programs promoting such practices still face low uptake rates. Some possible barriers to the adoption of improved natural resource management practice may include the following:

- Lack of information about such practices
- Uncertainty about the costs and benefits of improved management practices
- Risk aversion with uncertain yield impacts
- Short planning horizons
- Poor coordination among peers with shared resources

The BASIS AMA Innovation Lab now supports projects investigating mechanisms to promote improved natural resource management among smallholder farmers.

Projects Under Theme E

- *Smart Subsidies to Promote Peer Monitoring of Conservation Agriculture Compliance in Malawi*
  Gregory Parkhurst, Weber State University
- *Rural Livelihoods and Institutional Reform in Small-Scale Fisheries in Tanzania*
  Yaniv Stopnitzky, University of San Francisco

Smart Subsidies to Promote Peer Monitoring of Conservation Agriculture Compliance in Malawi

Lead Institution	Weber State University
Principle Investigator	Gregory Parkhurst
Country	Malawi
Mechanism Under Investigation	Agglomeration payments to promote conservation agriculture
Timeline	1 March 2014 – 30 September 2017
Commodity	Conservation Agriculture (non-specific)

Background

Conservation agriculture (CA) in developing countries has received significant attention over the past several decades as a method of farming that promotes soil fertility and sustainable yields, reduces soil erosion, and sedimentation. In Malawi, the application of CA (such as incorporating no-till, mulching, and intercropping) has been identified as a best practice that should increase yields, particularly in low-rainfall areas. However, the adoption of CA practices in Malawi and other regions of Sub-Saharan Africa have been disappointing, arguably due to inadequately designed CA policies with insufficient economic incentives to overcome barriers to adoption for local farmers. Some of the impediments to adoption have been identified as a lack of information about CA management practices, uncertainty concerning costs and benefits of CA practices, sensitivity to increases in yield variability, shorter planning horizons and high discount rates.

Numerous global programs have been implemented over the past three decades in an effort to promote food security and quality of life through the increased adoption of CA in Sub-Saharan Africa. Although a few CA policies have been successful, generally barriers to adoption cause farmers to dis-adopt CA practices or to be in noncompliance with CA agreements before farmers can realize personal gains from CA techniques.

Project Summary

In this project, researchers propose to implement and evaluate an agglomeration bonus incentive scheme to provide incentive to farmers to adopt and retain CA practices. The agglomeration bonus is a two part scheme: 1) a flat subsidy is given to landowners to voluntarily participate in the CA program; and 2) an agglomeration bonus is paid to landowners when their land enrolled in the CA program shares a common border with a neighboring parcel also enrolled in the CA program.

This interdependence between neighboring landowners' agriculture decisions creates a positive network externally that provides an incentive for each adopting landowner to serve as an "extension agent" promoting CA to their neighbors, potentially increasing the rate of adoption in a community. The research team's current work suggests that agglomeration bonus payments may also offset some program costs by reducing moral hazard and encouraging sustained adoption. This project, in partnership with the Malawi Department of Land Resources and Conservation (DLRC) and the National Smallholder Farmers' Association of Malawi (NASFAM) and leveraging a recently funded evaluation of agglomeration payments led by the International Food Policy Research Institute (IFPRI), will evaluate the reduction in moral hazard that agglomeration

payments (AP) may allow in the promotion of land conservation practices in Malawi's Shire Valley basin.

More specifically, this project is evaluating the impacts of AP on the adoption of agricultural conservation technologies being promoted by the Government of Malawi, under different conditions of compliance monitoring, providing an understanding of the role that societal pressures and interactions play in reducing monitoring costs and improving program effectiveness.

The two-pronged research strategy begins with an IFPRI led study to evaluate the importance of monitoring effort across conventional voucher programs aimed at improving adoption of conservation agricultural technologies. The study randomizes both against whether a conventional voucher or conventional voucher in combination with agglomeration payments are received, as well as over monitoring level (full monitoring effort, partial monitoring effort, or no monitoring effort). In addition, the research team is contributing to the development of a coupled agent-based model (ABM) of the Shire Valley basin system to evaluate the consequences of improved adoption of sustainable agricultural practices.

While some impacts (such as changes in labor an input costs) may accrue rapidly and be immediately observable in the study, others (such as shifts in yield or water quality) may take years of consistent CA implementation to emerge. The coupled pilot study and modeling exercise of this project will overcome this challenge by combining field data collection with agent-based and hydrologic simulations. The resulting analysis, in conjunction with the conventional voucher and AP incentive schemes, captures many of the potential long-term environmental and ecosystem-service outcomes within a timeframe more amenable to research projects and decision-making processes.

Current Activities and Achievements

In this reporting cycle, the research team has completed all first year activities with one major exception. The GPS units secured were not used by field extension officer staff to take plot boundary measurements during 2014/2015 registration, and as a result aerial survey by plots was not possible. Additionally, heavy storms complicated collection of aerial survey data during season. This issue arose from the lack of capacity in the government implementing partner in the field.

In response to this issue, for 2015/2016 registrations, researchers have engaged graduate students as central data collectors, assisted by field extension officers. This is meant to continue a level of capacity building for data collection among field officers, but avoid the issues in data collection encountered in 2014/2015.

Voucher program: After some planning with implementing partner NASFAM, the project group was extended to include AGORA, the major dealer of agricultural inputs in the project region. The structure of the agreed-upon voucher program is that the student-field officer teams issue vouchers in the field that are redeemable against any purchase at AGORA outlets. In turn, AGORA dealerships can redeem their collected vouchers for 120% of the face value at NASFAM offices. AGORA dealers maintain a list of voucher IDs and voucher values (no personal information), and log redeemed vouchers as well as purchases. Farmers may club vouchers together on a single purchase, and in the case of more remote villages, AGORA sends mobile input shops on a schedule. This program has been implemented successfully in 2014/2015 and will be continued in 2015/2016.

This project has as an immediate goal the evaluation of a particular incentive in the promotion of conservation agriculture, a goal that will not reach until the end of data collection. In the interim, the project has a number of economic experiments embedded in data collection activities geared toward understanding more broadly what shapes adoption of conservation agriculture, and from these activities we have some early findings worth highlighting.

Our DCE results indicate current farm level practices largely influence willingness to adopt the full CA package (of zero tillage, intercropping, and residue mulching). Providing subsidies can provide some perverse incentives. Subsidies may increase the adoption of intercropping and residue mulching, but adoption of these practices may crowd-out adoption of zero-tillage leading to partial compliance. Interestingly, exposure to drought was not a motivating interest in adoption, while exposure to risks such as flooding and insect infestations were found to reduce perceived value of CA practices.

Results from probit analysis of compliance with program objectives in the first year of the program are still in development. Early findings are that i) those that register in the program at all are more risk seeking than the baseline across villages, ii) the agglomeration payment has a significant impact in encouraging mulching, and iii) there appear to be antagonisms among components of the CA package – while mulching and zero tillage are commonly adopted together, there is a negative association between zero tillage and intercropping.

This years addition of a modeling activity, currently in the early stages of a modeling paper, presents in a rigorous framework the premise that agglomeration payments have the potential to improve levels of adoption of pro- environmental practice per program dollar, and may help to reduce required spending on project monitoring and enforcement.

Collaborators and Partners

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New York University
Andrew Bell, Assistant Professor

International Food Policy Research Institute (IFPRI)
Klaus Droppelmann, Contractor

University of Leeds
Tim Benton, UK Champion for Global Food Security, Professor of Population Ecology

National Smallholder Farmers' Association of Malawi
(Implementation partner)

Capacity Building

Researchers conducted two-day trainings on data collection in Balaka, Malawi, on the use of tablet PCs and GPS units. In sum, nearly 70 field officers from NASFAM, DLRC, and the Ministry of Agriculture Irrigation and Water Development (MoAIWD) participated. Objectives included

introducing participants to the use of tablets and GPS machines in data collection, and training them in new computer software to highlight the importance of good data collection. After the training workshops, the researchers could then proceed with data collection jointly run by students from LUANR and the field officers. An additional 1-day training was conducted with students, most of whom participated in the original baseline data collection, to build the data collection team.

Researchers also conducted a small workshop with project collaborators in Lilongwe in late August to firm up plans and schedule for year two, and discussed capacity building goals for the following year. A plan is in place to develop a short course for NASFAM/DLRC and other interested collaborators for summer 2016, to take place over a one-week period and include curricula on data collection, storage, management, and basic approaches to analysis.

Outputs

The following journal articles are in progress:

- Journal article based on Discrete Choice Experiment in Baseline survey submitted to Agriculture, Ecosystems, and Environment
- Journal article based on initial Agent-based model findings submitted to Ecological Economics
- Journal article based on 'early adopters' from first year of data collection in preparation (most likely for the American Journal of Agricultural Economics)

Next Steps

In October 2015, researchers will enroll farmers into the second year of the conservation agriculture incentivized treatments for the planting season beginning in November 2015. During early Spring 2016 the aerial survey of registered plots will be launched. In April, May and June, researchers will be paying the farmers their earned subsidy dependent upon the treatment enrolled in, own conservation behavior and the conservation behavior of neighboring farmers.

Researchers are currently discussing with partner NASFAM to add an additional small activity to our program. This activity will engage a small number of farmers in the treatment villages in ethnographic interviews for the purpose of 'ethnographic decision tree modeling'. This approach takes an interview-based approach to eliciting decision criteria from those who adopted (or didn't adopt) conservation agriculture and draws these criteria together into a composite decision tree model for the process of adoption. In the next reporting cycle, researchers hope to conduct on the order of 100 interviews, and use the 2016 endline survey as an opportunity to generate a validation dataset for this structured model.

Rural Livelihoods and Institutional Reform in Small-Scale Fisheries in Tanzania

Lead Institution	University of San Francisco
Principle Investigator	Yaniv Stopnitzky
Country	Tanzania
Mechanism Under Investigation	Experimental Games as Tool for Improving Institutional Performance
Timeline	May 2014 – September 2015
Commodity	Fisheries

Background

Millions of rural Tanzanians depend on fisheries for their livelihoods and as a key source of nutrition. Fisheries differ from most agricultural food systems in a fundamental way that can limit the impact of technological innovation on improvements in productivity, rural income, and food security – namely that fisheries depend on a common-pool resource. Because it is difficult to exclude others from entering a fishery, and because use of a fishery is rivalrous, fisheries naturally suffer from the "tragedy of the commons," in which excessive entry results in overexploitation of the resource.

The tragedy of the commons in small-scale fisheries is compounded in developing countries, as participants are often in a poverty trap. In such environments, labor is abundant and opportunity costs created by other options are low. As a result, small-scale fisheries attract an overabundance of entrants and leading to equilibrium in which biological productivity – and thus economic surplus – is extremely low. The result is a dynamic poverty trap in which technological innovation or improved infrastructure can actually make the fundamental problem worse: improved fishery conditions attracts additional entry and increases the fishing pressure on an already overexploited stock, further reducing biomass, biological productivity, and economic surplus. Without institutional reform that addresses the fundamental challenge presented by the common-pool nature of small-scale fisheries, rural communities are unable to reap the benefits that technological progress offers and the poverty traps will endure.

Despite the importance of institutions in the shaping of development outcomes, research focused on understanding how institutions emerge, adapt, and change is still in it infancy. With command-and-control approaches to fisheries management largely being recognized as ineffective for small-scale fisheries in developing countries, understanding the mechanisms that foster the development of strong local institutions for small-scale fisheries management is of critical importance. This is especially true given that a bottoms-up approach to managing small-scale fisheries in developing countries is not guaranteed to succeed. Indeed, the extent to which strong institutions develop from a bottoms-up approach depends on the ability of fishery users to collectively govern the fishery resource in a manner that resolves externalities and internal coordination tasks efficiently, fairly, and with low transaction costs.

Project Summary

The research team, led by Dr. Stopnitzky at the University of San Francisco, will test a novel approach to improving institutional performance. Numerous laboratory and field experiments have demonstrated that individuals gain experience when playing repeated experimental games, which then alters their patterns of coordination and cooperation. Thus far, no one has used repeated game play as a pedagogical tool for training individuals and groups in how to participate more effectively in the real-world institutions of which they are part. The hypothesis the researchers aim to test with this research project is that by using experimental games to focus attention on critical aspects of how individuals affect (and are affected by) institutional performance, it will be possible to foster cooperation, monitoring, punishment, or other improved behaviors. In turn, these improved behaviors can lead to better institutions. Participating in these repeated games, therefore, primes participants to participate more fully/accurately/continuously in the real-world institutions of which they are a part. In this way, it is hypothesized that capacity building via carefully structured game play can improve institutions endogenously.

Researchers will test whether capacity building through repeated games can improve fishery management institutions in rural Tanzania. For more than a decade, development agencies have promoted co-management strategies based around community associations known as "beach management units" (BMUs). These BMUs are often weak and face unclear incentives.

Before researchers can test the hypothesis that capacity building through game play can improve institutions from within, it is necessary for the research team to conduct ethnographic research and document local institutions, describe how they have changed over time, how they vary across BMUs, and how they interact with federal institutions for fisheries management. This ethnographic research will play a critical part in defining the outcome variables for the baseline and end line data collection. Then, to test the hypothesis, researchers will design games that are framed as closely as possible to the real-world issues facing local management. These games will be played on a weekly basis over a period of one month. Pilot experiments will be conducted in a small number of BMUs to gather preliminary evidence of the extent to which capacity building via game play can improve institutions. Baseline and endline measures of individual behavior/well being and institutional performance will document the effects of this training.

This project supports preliminary fieldwork to address remaining challenges and risks. Researchers hope this pilot work will generate some proof of the concept that experimental games can alter behavior outside of the game setting and therefore improve institutional performance.

Collaborators

University of Alaska-Anchorage
Matthew Reimer, Assistant Professor, Institute of Social and Economic Research, Department of Economics

University of Dar es Salaam
Paul Onyango, Lecturer (Assistant Professor), Department of Aquatic Science and Fisheries

University of California, Davis
James Wilen, Professor, Department of Agricultural and Resource Economics

Current Activities and Achievements

In this reporting cycle, the research team has been actively preparing project implementation plans for field research. We are currently selecting districts to work in developing new methods for eliciting truthful responses about sensitive real world behavior, and identifying the best groups with which to play the game. Researchers determined following the work last summer that future game efforts should be focused on the BMU committee, which is primarily responsible for enforcing policies the team aims to improve, rather than fishermen per se. The team is currently debating whether to structure an arm of the study that focuses on playing the game with groups comprised of players from different BMU committees in order to examine how incentives affect inter- vs intra-BMU group play.

The team acknowledges that measurement of the outcomes outside of the game setting continues to pose challenges to our study. The primary complication is accurate measurement of cheating levels and enforcement within a village/BMU. While researchers believe methods such as list randomization will help get better answers than direct questioning, concerns remain about how accurate these measures will be. To address this issue, the primary survey questions were modified as well as the experimental design. Because fishermen nearly always reported "good" knowledge/attitudes about cheating/cooperative behavior, at levels that seem unrealistic, the learning questions were modified. The primary outcomes of interest are now a series of hypothetical choice experiments, which were constructed to elicit more truthful and accurate answers to issues surrounding cooperation and cheating.

Researchers also needed to spend time this reporting cycle altering the manner in which they are attempting to identify treatment effects from the game. Last summer, the team attempted to identify learning via within-subject exposure to the game. This summer they are using cross-sectional variation (across BMUs) in performance on the hypothetical choice experiment to identify impacts after playing our CPR games.

In addition, much work this year went into outputs. Using data from the first round of fieldwork in summer 2014, two working papers have been prepared on topics related to fishermen behavior in co- operative institutions.

Capacity Building

In this reporting period, while the researchers were in-country, they met and shared their work with representatives from the Tanzania Fishery Research Institute (TAFIRI), The Nature Conservancy, and the World Wildlife Fund; these groups were all very supportive of the project and opened the door for possible capacity building and collaborative efforts in the future.

More broadly, the mechanisms for collaboration and capacity building for this project are integrated both in the intervention itself and in the ancillary activities used to evaluate the

impact of the intervention. First, the primary hypothesis researchers will evaluate is focused on how to build capacity. Therefore, the research has as its foundation close interaction and cooperation with local institutions comprised of fisherman.

All project activities, including survey instrument and game design, ethnographic research, the intervention itself, data collection and analysis, and dissemination will all be conducted in close partnership with academic partners at the University of Dar es Salaam's Department of Aquatic and Fisheries Science.

Outputs

Working papers have been prepared on two topics studied in the course of preliminary fieldwork in summer 2015. The first examines the counterintuitive finding that fishermen in one variant of our CPR game, the one which includes the possibility of enforcement, sees higher levels of harvest albeit with no differences in cheating levels nor actual enforcement. The evidence suggests that institutions that impose enforcement along one dimension (i.e. cheating behavior) cause a substitution into more individualistic behavior along other margins (i.e. harvest rates). The second paper, coauthored with a USF graduate student, tests whether poverty and scarcity triggers affect cognitive performance, replicating results from Mullainathan and co-authors in a new setting. The results fail to find evidence of the effect of scarcity on cognitive behavior as measured with Ravens and Stroops tests, but there is novel evidence that the scarcity trigger affects cooperative behavior in our game setting. The team aims to finalize these papers and submit them to peer-reviewed journals within the next two months.

Other outputs for this period include a data set on individual characteristics and game-based behavior of 298 fishermen who are members of BMUs. Because they played the game in groups, this corresponds to approximately 67 instances of playing a variant of the dynamic common pool resource game. Once current fieldwork is completed, an additional dataset based on games and surveys of 400+ additional fishermen, as well as data on actual earnings in the game will be available.

Next Steps

Once the data from round two fieldwork is prepared, researchers will begin investigating the impact of game play on hypothetical choice experiments. Preliminary results should be available by the time the project ends at the end of the 2015 calendar year. Once all of the surveys and data have been analyzed in this next reporting cycle, the researchers will create additional dissemination materials (beyond the current two working paper in progress) based on the final results.

RESEARCH THEME F: SOCIAL SAFETY NETS AND PRODUCTIVE ASSET TRANSFERS TO ADDRESS PERSISTANT POVERTY

Social protection programs have been widely considered a promising solution for persistent poverty. Productive asset transfer programs are a particularly popular form of social protection for vulnerable populations, often supplemented with trainings for human capital development.

Projects Under Theme F

- *Evaluation of the Welfare Impacts of A Livestock Transfer Program in Nepal*
  Nicholas Magnan, University of Georgia

Evaluation of the Welfare Impacts of a Livestock Transfer Program in Nepal

Lead Institution	University of Georgia
Principle Investigators	Nicholas Magnan
Country	Nepal
Mechanism Under Investigation	Physical, Human, and Social Capital Transfers
Timeline	1 March 2014 – 30 September 2017
Commodity	Livestock

Background

Social protection policies and programs have been widely heralded as important for addressing persistent poverty. The aim of social protection is to enhance the capacity of poor and vulnerable persons to manage economic and social risks. Productive asset transfer programs, often involving livestock, are a particularly popular form of social protection for vulnerable populations. Heifer International, the implementation partner for this project, is widely recognized as a global leader among organizations providing livestock transfers to poor households.

In recent years, Nepal has made significant strides towards poverty alleviation, but poverty persists, especially in the countryside; 55 percent of Nepalese earn less than $1.25 per day, but that number climbs sharply in the rural mountain and hill districts where more than 70 percent of people rely on agriculture for income generation. The relative importance of livestock to Nepalese smallholders in these areas has grown steadily in recent years. In the rural hill and mountain districts, livestock ownership is highly correlated with consumption of meat and income, suggesting that livestock transfers may be an effective form of social protection.

Project Summary

This project seeks to disentangle the importance of physical assets relative to human and social capital in the provision of social protection designed to improve (and permanently alter) the nutritional and economic outcomes for the chronically poor in Nepal. This project will evaluate the welfare impacts of a social protection program implemented by Heifer International in Nepal. Programs like Heifer's typically seek to improve the productive capacity of households through the provision of physical, human or social capital, and often some combination of the three "packaged" together. Through a randomized control trial (RCT), researchers will be able to compare the average treatment effect of different "packages".

The three types of transfers for the study include: a) "social capital investments" through facilitated group formation with the explicit goal of savings, and a series of empowerment training sessions, b) "human capital investments" through participation in trainings covering a wide variety of technical topics related primarily to livestock management, and c) "physical capital investment" " in the form of a productive asset transfer (of variable timing) in the form of livestock.

The first treatment group will benefit from all three transfers (social/human/physical). A second treatment group will benefit from social and human capital investments. A third group will benefit from both physical and human capital investments. A fourth group will be randomly selected as control.

Within each treatment group there is a second temporal level of randomization: some households were randomly selected for early treatment, while others are intended for a delayed treatment. For both early and delayed treatment, social capital investments will be made (in groups 1 and 2) between the first and second survey round. Human and physical capital investments will be made after the first survey for the early treatment group, and after the follow up survey for delayed treatment groups (but before the final survey). However, delayed beneficiaries in groups 1 and 2 may benefit from the expectation of known future transfers.

The qualitative research component will complement the quantitative to provide a deeper understanding of the impacts of the Heifer program on welfare indicators, especially female empowerment and aspirations. This component of the study will focus on farmers' perceptions – both beneficiaries and non-beneficiaries – of the perceived impacts of the program on individual, household, and community welfare, and on the control of assets within households. While most of the informants will be women, men will also be interviewed. One major focus of this study is the intersection of gender and caste/ethnicity, religion, class, and other vectors, and how the intersection affects the aspirations and ability of specific women to benefit from the physical asset (livestock) transfer program.

Collaborators

Host Country PIs:
Rajendra Pradham
Dean, Nepa School for Social Sciences and Humanities

Sudhindra Sharma
Adjunct Professor, Nepa School for Social Sciences and Humanities

Collaborating Researchers:

Sarah Janzen, Assistant Professor, Department of Agricultural Economics and Economics, Montana State University
Ruth Meinzen-Dick, Senior Research Fellow, International Food Policy Research Institute

Collaborating Partners:

Neena Joshi, Senior Program Manager, Nepal Heifer International
Rienzzie Kern, Senior Director of Planning, Monitoring, and Evaluation, Heifer International

Current Activities and Achievements

In this reporting cycle, many key activities were accomplished. In terms of the baseline data analysis, several analyses have been completed, including balance checks to see if the stratification and randomization are as anticipated (they are), and in-depth analysis of the aspirations and mental health data. This work was led by the quantitative researchers: Janzen, Magnan, Thompson and Sharma. Two researchers at Nepa School worked on the baseline data analysis from mid-April – mid-July 2015 and submitted a preliminary report of the baseline survey.

Analysis of gender-disaggregated asset-ownership responses has also occurred. The gender-disaggregated asset-ownership data experiments are part of a collaboration with IFPRI (specifically Cheryl Doss, Kate Ambler and Caitlin Kieran). The objective of this project was to improve methods of collecting reliable and accurate sex-disaggregated household survey data on individual-level asset ownership and asset decision-making. In order to develop rigorously-tested methodologies for survey and sampling design, data experiments were included in the baseline survey to compare the results of different methods of collecting data on joint and individual asset ownership and asset decision-making. This analysis seeks to better understand why differences in reporting may occur. Analysis is ongoing.

Qualitative research fieldwork was undertaken beginning in January 2015. A month-long training was conducted for 17 researchers (instead of 9 researchers as planned earlier) which included computer skills, reading literature, learning qualitative research tools and preliminary field visit in January-February. A fieldwork manual was also prepared. Two researchers participated in an on-the-job training programme to enhance their research, analysis and writing skills.

On April 25, 2015 Nepal was struck with a massive earthquake measuring 7.8 on the richter scale. Thousands were killed, and millions were displaced. A Skype meeting was held with partners at Heifer International headquarters and Heifer Nepal on June 10 to discuss implications for the research. Heifer Nepal confirmed that the damage was isolated to 2 study districts - Dhading and Nuwakot - but catastrophic there. It was agreed that those districts (10 VDCs) can no longer be included in the study. (They are starting at zero - or less than zero - and there will be many aid organizations working there, so it will be futile to look for HI program impacts.) HI will continue to work there, but not maintain treatments and control and tailor a program to the needs of those communities. Power calculations suggest a small loss of power but we are optimistic that program impacts will still be observable. (Combining treatments was deemed impossible.) The other study sites all have their goats and were not significantly affected so it will be business as usual. Researchers will continue to do surveys in Dhading and Nuwakot, with the goal of learning about resiliency in the face of disaster rather than program impacts.

A new promising research agreement was made between Montana State University and IFPRI for the CSISA (Cereals Systems Initiative for South Asia) project led by David Spielman. This agreement augments the larger research project with a focused study on the importance of aspirations (and aspirations failures) in economic decision-making. Using data on economic status, aspirations, and psychological well-being collected in June 2014 and networks that was collected in August 2014, researchers are now testing how the economic stature of those in an individual's social network effect their own aspirations and forward-looking economic behavior. Aspirations gaps can also be measured by looking at one's aspirations (potentially influenced by those in their network) and test for correlation between aspirations gaps and psychological wellbeing.

Capacity Building

The capacity building activities conducted as part of this project included student training, survey team training, collaborating researcher training and partner training. Four students received training as part of this project: A PhD student at University of Georgia (Will Thompson), an undergraduate student at Montana State (Jacob Sharp), and two post-graduate fellows at Nepa School (Anjam Singh and Prabin Nanicha Shrestha).

In addition, 17 researchers trained were during a workshop on research methodology and proposal writing. These same researchers were trained in qualitative fieldwork methods, including fieldwork methods in FGD.

Outputs

University of Georgia graduate student, Will Thompson, co-authored a working paper entitled "Social drivers of aspirations formation and failure in rural Nepal" which he presented at two major conferences (Agricultural and Applied Economics Association Annual Meetings and the Triennial International Conference for Agricultural Economists).

Separately, this project was presented at two conferences: American Agricultural Economics Association Annual Meeting and the International Conference of Agricultural Economists.

Additional outputs include preliminary project baseline and qualitative datasets and two trip reports for IFPRI fellow, Ruth Meinzen-Dick and adjunct professor, Sudhindra Sharma.

NEXT STEPS

Next year's work will involve three key components: preparation for and implementation of first follow-up household survey, and both quantitative and qualitative data analysis.

1. First Follow-up Household Survey Planning and Implementation: The first follow-up survey is planned for March 2016. Planning will begin this fall. The April 2015 earthquake presents added complexities that will have to be taken into account. Issues include finding migrants from Nuwakot and Dhading (the most heavily hit areas) and dealing with post-disaster law and order in Mahottari and other Terai districts. In addition, careful thought will be given to survey design as new research questions related to resiliency and coping in the face of the earthquake are of great interest.

2. Quantitative Data Analysis: Analysis of the household survey has begun and will continue into the next fiscal year with theoretical analyses of aspirations formation and failure, as well as preliminary impact analyses regarding the Heifer intervention and resilience after the earthquake.

3. Qualitative Data Analysis: The qualitative research is meant to supplement and complement the quantitative study. It will in addition address specific issues such as how the intersection of gender with other vectors of domination (class, caste/ethnicity, generation) affects specific women's ability to benefit from development programs such as Heifer's goat transfer program. A related issue to be addressed is how the plural norms and practices concerning distribution of property rights within households, especially concerning productive assets, affect the ability of women to benefit from asset transfer. It will explore the usefulness of the Women's Empowerment in Agriculture Index in understanding whether and how women are empowered by transfer of goat project, by asking about specific, concrete cases of decision-making and other empowerment index.

"Advancing Index Insurance
by Closing the Gap between Knowledge and Implementation"

PROJECT DESCRIPTION

Despite some positive results in recent years, there are still many barriers and technical challenges to realizing the full potential of index insurance and responsibly scaling it up. The BASIS Assets and Market Access Innovation Lab and its affiliated I4 Index Insurance Innovation Initiative (hereafter AMA/I4) have been part of a set of global institutes, firms and agencies that have tackled these problems head on, trying to devise solutions and test pilot them. The Advancing Index Insurance award will allow AMA/I4 to capitalize on past USAID efforts and, in cooperation with other global partners, help guide this new-found political momentum towards responsible and reliable index insurance solutions to the age-old problem of uninsured risk.

More concretely, this award is an exciting opportunity to close the gap that often exists between knowledge generation and large-scale project implementation. To close the knowledge-implementation gap, AMA/I4 will:

1. Cooperate with the ILO's Microinsurance Innovation Facility to create a Secretariat for a Global Action Network of expertise that will contribute to the goal of advancing index insurance at scale by (i) convening working groups to solve specific problems such as reinsurance, (ii) issue best practice guidelines, tools and advice; and, (iii) organize outreach and knowledge dissemination events;

2. Contribute to the design, implementation and evaluation of one or more large-scale index insurance programs under the aegis of the Political Champions initiative;

3. Play a leadership role within the GAN to create a cost-effective, public private partnership to reinsure index insurance in environments with sparse data and implement that partnership in at least one large-scale project; and,

4. Identify remaining knowledge gaps on index insurance and work with the GAN research council to commission needed research and pilot activities.

COLLABORATORS

The BASIS AMA Innovation Lab will sub-contract with the Microinsurance Innovation Facility (housed at the Social Finance Programme of the International Labour Organization in Geneva) to serve as the Secretariat for the Global Action Network (GAN) to promote index insurance. As the GAN Secretariat, the Facility will advance innovations in agricultural insurance and ensure quality implementation on the ground. To accomplish its goals, the Secretariat will focus on three main goals:

1. Establish and coordinate a *community of experts* that will serve as an action network that discusses key issues around agricultural insurance.
2. *Build capacity* of practitioners and governments in three focus countries; coordinate country strategies and work plans; explore collaborations with existing initiatives; develop and conduct training for practitioners.
3. *Promote responsible scaling of agricultural insurance* to the broader insurance community by repackaging and disseminating lessons into knowledge products, tools, and training modules.

The BASIS AMA Innovation Lab is also currently discussing a possible collaboration with researchers at Cornell University to examine a range of drought-related satellite indices based on data sources and parameters used by insurance and social safety net programs in Kenya, in order to determine which is most appropriate for an index insurance product that aims to protect households from drought related shocks. We anticipate to have much more to report on this in next year's annual report.

ACHIEVEMENTS

The International Labor Organization/Global Action Network facilitated two face-to-face group meetings. One, in November 2014, was held in Mexico City and established the working groups. A follow-up meeting in London in April 2015 helped to define the purpose and objectives of each working group. In addition, the ILO selected to focus countries (Bangladesh and Senegal) to focus on for methods to accelerate the development of inclusive agricultural markets in each country.

The ILO also organized one webinar and one Knowledge Sharing Forum (held in Paris adjacent to a significant and relevant conference) as outreach events to stimulate discussion and improve awareness and feedback around the work of the GAN. Finally, BASIS researchers drafted initial considerations for safe minimum standards for index insurance, which were shared at the Paris Knowledge Sharing Forum for comment and feedback.

NEXT STEPS

Early in the coming fiscal year, the AMA Innovation Lab will put in place a contract with Cornell University to determine which satellite-based indices are most appropriate for an index insurance product that aims to protect households from drought-related shocks. In addition, the ILO and the GAN will lead efforts to develop a comprehensive client value assessment tool adapted for index insurance. A GAN working group will assess the feasibility of mechanisms for pricing insurance products under uncertainty with the goal of generating a generic, replicable mode for risk transfer to lower the uncertainty of risk for reinsurers and insurers. The hope is that this will crowd in more players, lower premiums, and incentivize better data collection to help in the accurate pricing of insurance.

"Achieving Development Impact with Complementary Stress-resistant Seed & Financial Technologies: A Proposal to Learn from the DT Mass Scaling in Mozambique and Tanzania"

PROJECT DESCRIPTION

Myriad research has identified the human costs of climatic stress such as drought, including maternal BMI declines, slow growth rates among children, and – in the case of young children – severely damaged long-term cognitive development. In fact, the average impact of drought on children in these households is fifty percent more severe than the estimated average effect.

Recent years have seen the separate development of two technologies designed to help small-scale farmers manage climatic stress. The first technology is seed varieties that better withstand climatic stresses like droughts and floods. The second is the financial technology of index insurance that transfers risk out of small-scale farming systems by issuing compensatory payments when climatic events occur and agricultural production collapses. These two technologies work in a similar way, but some important differences create a potential complementarity between the two.

Both stress-resistant seeds and insurance are designed to stabilize producer incomes in the wake of an adverse event. Both have the potential to generate a risk reduction dividend as farmers with these risk management tools may invest more heavily in their farms. Yet, these technologies also have important differences. Most importantly, stress-resistant seeds tend to fail under extremely adverse events, whereas index insurance does not. For example, the flood resistant rice varieties can survive up to 17 days of flood-induced submergence, but beyond 17 days die and yield nothing (just like conventional rice varieties). While insurance payments generally increase as stress conditions become more severe, protecting against moderate stress with insurance can be very expensive – and this moderate stress protection may be more effectively provided by stress-resistant seeds. This creates a natural complementarity between the seed and financial technologies.

While the work to date on these new technologies is encouraging, it has neither explored their complementarities, nor has it traced out their impacts on nutrition. With new drought tolerant (DT) maize varieties ready to go to market, and with our growing knowledge of how to design effective insurance products for small-scale agriculture, now is an opportune moment to close this critical knowledge gap. The Drought Tolerant Maize for Africa (DTMA) project has developed over 140 DT maize varieties that reveal impressive results overall, but that fail – like conditional varieties – in extreme drought conditions. It is under these conditions that novel financial technologies, like index insurance, can potentially complement and deepen the impact of DT seed technologies on the livelihood prospects and reduce the vulnerability of poor farmers. This study will explore the determinants of uptake and measure the impacts on on-farm investment levels and nutritional outcomes of DT varieties alone and bundled with a complementary insurance product.

COLLABORATORS

This research is being conducted with researchers from CIMMYT. The focus countries were selected and the proposal developed in collaboration with CIMMYT researchers. The research team is also working closely with the Drought Tolerant Maize for Africa (DTMA) project on country selection. In addition, CIMMYT has agreed to use the funds that has allocated for an impact study of the program in Mozambique and Tanzania to fund certain arms of this study. CIMMYT scale-up funds will also be available to defer any extraordinary roll-out costs that may be experienced by participating seed company partners, to ensure that free trial seed packets can be distributed to farmers in the study. Researchers will also partner with seed and insurance companies in each country.

ACHIEVEMENTS

The achievements for this year have primarily been administrative in nature. In addition to submitting the proposal and getting the award from USAID in place, the BASIS AMA Innovation Lab have taken steps to lay the groundwork for implementation of the project in the next year. The research team established partnerships and MOUs with three seed companies in Tanzania and two in Mozambique. Researchers also met with one insurance company in Tanzania and two in Mozambique to discuss possible partnerships.

The research team has developed field-testing and evaluation strategies in both countries, including development of relationships with local government extension networks in Mozambique and the Village Based Agent networks of Farm Input Systems (FIPs) in Tanzania. The research team also developed educational material to explain the use and benefits of drought tolerant seed varieties to the targeted farmers.

NEXT STEPS

In the next year, this activity will distribute trial seed packets to 2,000 farmers (the treatment group of the research activity) in Tanzania and Mozambique. The research team will develop and index insurance contract based on ground-truthing remote sensing based indices, and will finalize partnerships with at least one insurance company in Mozambique and one in Tanzania. As part of the evaluation, the research team will implement a baseline survey with a total of 3,000 across both countries. Local enumerator teams will most likely be drawn from the staff of respective national agricultural research services, who will be trained in the use of digital data collection.

The BASIS AMA Innovation Lab was designed and structured such that its most durable and dynamic impacts on the capacity of individuals and organizations comes through the collaborative research process. These individuals and organizations are committed to solving, and are well positioned to help solve, long-term development problems. By working through United States research universities and requiring substantive partnerships with in-country research collaborators, the BASIS AMA Innovation Lab structure co-produces training and capacity building as part of the research process.

The collaborative relationship between US and host country PIs can form a true intellectual partnership that can result in tremendous and long-lasting gains, not only to the host PI, but also to the future generations of students that the PI may train. The BASIS AMA Innovation Lab looks explicitly for this kind of intellectual partnership in review of research proposals, striving to select research teams that have a strong relationship and that substantively involve the host country PI's.

SHORT- AND LONG-TERM TRAINING

Most BASIS AMA Innovation Lab research activities utilize the talent of long-term students at U.S. universities to provide substantive assistance in the implementation of research activities. By actively engaging students to work on their awards, the researchers develop their capacity through the application of their skills to gain hands-on field experiences. In addition, students at the host institution of the host-country researcher are often actively engaged in collaboration on these research activities in country, further developing their education and experience through hands-on learning.

These students have student status at a university, but are conducting essential activities in their work on the project. As such, the "training" component is secondary to the primary employment purpose of helping to conduct research activities under the principal investigators. Because of their enrollment in a long-term academic program, we include these students "working" on the project under "long-term training".

Researchers are also encouraged to provide direct capacity building through short courses on relevant topics, such as impact evaluation methodology or statistical methods. This training could be provided, for example, to the host country faculty's courses, and these skills could then be included in the host country faculty's ongoing curriculum for future graduate students, allowing for ongoing capacity building.

Finally, short-term training also occurs through the implementation of project activities. In many of the interventions, short-term training is a key component of the intervention being evaluated. These numbers, too, are included in "short-term training".

LONG-TERM TRAINING

Countries	Male	Female	Unknown
Burkina Faso	1	1	
Dominican Republic	1		
Ghana	1		
Haiti	1	1	
Kenya	1	1	
Malawi	1		
Nepal	4	1	
Tanzania	1		
Uganda	1		
Totals	**12**	**4**	

SHORT-TERM TRAINING

Countries	Male	Female	Unknown
Burkina Faso	3534	884	
Dominican Republic	1	8	
Ghana	488	68	
Haiti	7	2	266
Kenya	34	26	
Malawi			8
Mexico	378	93	
Nepal	16	16	
Senegal		1410	
Tanzania			25
Uganda		1411	
Totals	**4458**	**3916**	**299**

INSTITUTIONAL CAPACITY DEVELOPMENT

The BASIS AMA Innovation Lab model also creates the prospect for institutional capacity building. Through the contracting process between US-institutions and developing country institutions, these host country partner organizations gain valuable experience in award & contract management. These institutions can leverage this experience and demonstrated ability to accept and manage funds from international sources to try to secure additional funds from other sources in the future.

PARTNERS BY COUNTRY

Bangladesh: BRAC

Burkina Faso: National Agricultural and Environmental Research Institute

Ethiopia*:* IFPRI's Ethiopia's Strategy Support Program

Ghana: University of Development Studies, Savannah Agricultural Research Institute, International Food Policy Research Institute, African Center for Economic Transformation

Haiti: Quisqueya University, State University of Haiti

India: Agricultural Insurance Company of India

Kenya: Egerton University, Maseno University School of Business and Economics

Malawi*:* Lilongwe University of Agriculture and Natural Resources

Mexico: ITAM, QFPD

Mozambique: Banco Oportunidade de Mocambique

Nepal*:* Nepa School for Social Sciences and Humanities, Interdisciplinary Analysts

Senegal: Consortium pour la Recherche Economique et Sociale

Tanzania*:* University of Dar es Salaam, Sokoine University of Agriculture, Institute of Rural Development Planning (IRDP)

Uganda*:* College of Computing and Informatics Technology Makerere University, BRAC, Economic Policy Research Center

TECHNOLOGY TRANSFER & SCALING PARTNERSHIPS

B A S I S

PLAN OF ACTION

BASIS maintains a budget for project-end dissemination activities, so that as research projects have demonstrated that there is value in a certain technology, BASIS researchers and the Innovation Lab can work with those organizations that have potential to adopt and scale the technologies developed in the BASIS-supported research phase. This includes two evidence summits for the last two years of the current BASIS award, as well as annual budget for mission/USAID outreach, and a large meeting to discuss Index Insurance in Africa. This year, BASIS also hired a 60 percent Communications & Outreach Specialist to assist in these activities. The Specialist is anticipated to begin working at BASIS October 1, 2015.

STEPS TAKEN

Over the past year, BASIS AMA Innovation Lab and partners have launched and begun work on an associate award that has engages the issue of scaling of technology explicitly. This award, "Advancing Index Insurance by Closing the Gap between Knowledge and Implementation," specifically promotes the responsible scaling of agricultural insurance to the broader insurance community. By bringing together a community of experts, together with the developed expertise of BASIS and it's I4 Index Insurance Innovation Initiative, the activities under the associate award were designed to better understand and address the many barriers and technical challenges to realizing the full potential of index insurance and to responsibly scale it up. The work on this award is more thoroughly discussed elsewhere in this report.

The goals of scaling permeate the work of BASIS beyond this associate award, however. As standard procedure in the assembly of its research portfolio, the BASIS AMA Innovation Lab selected projects that have well designed partnerships with implementation partners that have the capability to scale out projects, if proven promising in the pilot and evaluation phases. By working alongside these partner organizations, BASIS researchers will be able to facilitate or assist with the scale up.

When feasible and appropriate, given the nature of the specific intervention under investigation, these implementation partners are private sector partners. This is done explicitly to promote project sustainability and potential for scaling of interventions evaluated to be useful and/or effective. First, by partnering private sector partners who may not have any experience with the intervention with experienced researchers, the research team can work with the private sector partners to identify any potential problems and develop solutions for effective implementation in the early "pilot" stages of the project, and before large scale implementation of a fatally flawed design. Second, private sector partners are often reluctant to adopt and take to market ideas for interventions (such as index insurance) that have not yet been proven to be feasible and/or effective in the field. By embedding the start-up of a new

financial innovation with an impact evaluation, a research project or impact evaluation can provide proof to private sector partners that there is a feasible, cost-effective way to implement the intervention. Finally, by integrating the launch of a product with an impact evaluation, once the intervention is over and the private sector takes over full implementation, a market has already begun to be developed for the product or intervention. These factors will benefit both private sector partners and the target populations by increasing opportunity for sustainable scaling of proven interventions.

PARTNERSHIPS MADE

In each project that pilots a financial or other innovative technology, BASIS looks for collaborative partnerships with appropriate private sector partners that will enable scaling of the project after the completion of the pilot research and evaluation. Though this varies based on country and nature of the project, in general this includes insurance companies, microfinance organizations, farmers' cooperatives, reinsurance corporations and/or banks. As described above, when possible BASIS researchers prefer to work with private sector partners who can sustain the intervention beyond the duration of the impact evaluation, if successful.

Under the "Advancing Index Insurance Associate Award" the BASIS AMA Innovation Lab has partnered with the Microinsurance Innovation Facility (housed at the Social Finance Programme of the International Labour Organization) to promote responsible scaling of index insurance to the broader insurance community. Another new associate award this year, "Achieving Development Impact with Complementary Stress-resistant Seed & Financial Technologies," also utilizes partnerships to evaluate and promote the scaling of successful technologies. By exploring the complementarities of agricultural and financial technologies, in partnership with both seed and insurance companies, the BASIS researchers involved in this project hope that both technologies will be more successful and effective in achieving their development goals, and in getting into the hands of farmers.

TECHNOLOGIES TRANSFERRED

During the past year, most BASIS projects have been mid-implementation. As a result, there are very limited results in terms of technologies that have been transferred – evaluation and analysis is ongoing. However, in the selection of projects, the BASIS management team and board of directors carefully selected projects that have a high potential for the scaling of activities after the research has been completed.

TECHNOLOGIES SCALED

Again, as described above, most of our projects are not at the appropriate point in their implementation timeline to be able to responsibly scale technologies. However, most projects have embedded within their design a question of scale.

For example, a project in Uganda being led by Stephen Smith at George Washington University is evaluating a scale back of assistance to promote use of improved seeds and fertilizer by farmers (through "model farmers" and proactive supply through village promoters) to see if these interventions can overcome barriers to the adoption of improved technologies. In addition, researchers are investigating whether a limited period of subsidization can improve farmer take-up of technology not only during the intervention, but after, as well. Another project, led by Craig McIntosh at University of California San Diego, aims to combine the market linkage services of a well-established and highly reputable private sector brokerage firm with other innovations to provide a multi-pronged set of solutions to problems with agricultural markets across a number of dimensions. This system, if successful, should be very easy to establish in new countries, greatly facilitating the scaling potential of this intervention.

TECHNOLOGIES READY TO SCALE

BASIS AMA Innovation Lab researchers continue to work to develop innovative satellite-based indices that can be reliably used to predict yields as part of an index insurance contract. Through public-private sector collaboration with a geo-spatial software engineering firm, Vencore, nearly a decade of raw satellite data has been converted into useful, widely applicable indices. While this enhanced index insurance program is still not a perfect predictor of the tangible agricultural risks facing farmers, it does demonstrate real promise of improving the welfare of agrarian regions through improved index accuracy.

This BASIS research highlights two important considerations for future projects. Public-private partnerships can produce cutting-edge methodologies. By reaching out to the firm Vencore to access unique expertise, BASIS researchers were able to use the algorithms produced from this partnership to implement fruitful innovations, lowering insurance costs and creating better protections for at-risk farmers. Thinking outside the box to creatively use available technologies can also improve research outcomes driving growth and production in Feed the Future countries and beyond.

RECRUITMENT & HIRING OF NEW PERSONNEL

Over the past fiscal year, the BASIS AMA Innovation Lab has experienced two sets of major personnel changes.

The first set of changes affected the position of financial analyst. First, we increased the time commitment of our dedicated financial analyst from 40 to 60 percent. This extra 20% FTE time is supported under the budget of the Global Action Network on Index Insurance Associate Award. Second, our previous financial analyst, Diane Jellison, left BASIS in June to accept another position. We conducted an open recruitment for this position, and we were very pleased to welcome Christine Helsing starting in September.

The second set of changes affected our communications and outreach. To date most of the communications and outreach work of BASIS had been done by the Assistant Director in whatever time was available, with some assistance from an external editor on contract and occasionally part-time student assistant. Now we've established a permanent staff position for a Communications and Outreach Specialist at 60% FTE. We will be welcoming Sophie Javers to the BASIS management team beginning in October.

ASSOCIATE AWARD FOR RESEARCH ON DROUGHT TOLERANT MAIZE & INDEX INSURANCE

In 2015 the BASIS AMA Innovation Lab was awarded a $2.25 million associate award (2015-2019) titled "*Achieving Development Impact with Complementary Stress-resistant Seed & Financial Technologies: A Proposal to Learn from the DTMass Scaling in Mozambique & Tanzania*." BASIS Director Michael Carter and Travis Lybbert at University of California Davis will conduct this research in collaboration with researchers from CIMMYT in both countries of research.

Often, interventions designed to improve nutritional outcomes has been approached by considering interventions or technologies that will, in a typical year, increase the local availability of nutritionally dense foods, or increase the incomes of rural families. In this study, researchers will consider the nutritional impact of scaling up "stress-resistant" agricultural technologies that are designed to stabilize production and incomes in atypical or "bad" crop years. This approach should reduce the human development losses that occur during periods of drought and other types of climatic stress that reduce incomes for both farm and landless labor families. In addition, stress-resistant technologies pay a "risk-reduction dividend," inducing behavioral change on the part of producers who intensify production, raising incomes and food availability levels in average, non-stress years. It is the goal of this study to determine if stress-resistant technologies are a cost-effective approach to meeting nutrition and health goals.

More information on this project is available in the "Associate Awards" section of this 2015 Annual Report.

CONSULTATIONS WITH USAID MISSIONS

As described in previous annual reports, BASIS has been continuing to work with a variety of USAID missions.

Dominican Republic
Since 2012 BASIS has been working with the USAID Global Climate Change Office and the Dominican Republic mission on an impact evaluation of an interlinked index insurance and credit intervention for dairy farmers in the Dominican Republic. The project has been beset with numerous delays, primarily due to negotiation with the myriad implementation partners regarding the nature of the product that will be used in the intervention. For more information, please see the relevant section of this annual report.

Nepal
In early 2014 BASIS began discussions with the USAID mission in Nepal about conducting a feasibility study of the potential of index insurance to meet development objectives for farmers in Nepal. After a visit and initial assessment in May/June 2014, BASIS researchers have been working with other collaborators to further evaluate the potential for an index insurance product that would both effectively protect farmers against risk and unlock investment opportunities for smallholder farmers. A final report will be given to USAID-Nepal in late 2015. For more information, please see the relevant section of this annual report.

Mozambique
USAID-Mozambique and BASIS have recently begun discussing the possibility of BASIS researchers conducting a rigorous impact evaluation around a recently awarded program in Mozambique targeting orphans and vulnerable children (OVCs). These discussions have been highly preliminary in nature, but now that the award for the program has been made, BASIS will soon initiate discussions with the implementer to discuss the potential for a meaningful evaluation of the program.

OUTREACH & DISSEMINATION

2015 Events
In April 2015, the BASIS Assistant Director attended the Feed the Future Innovation Labs Partners Meeting in Lilongwe, Malawi, which was designed to "improve connections and collaborations among Innovation Labs, Mission value chain programs and other USAID research programs". She participated in a panel titled "Sustainable Intensification: Technical, Policy and Market Challenges".

Planning for 2015-2016
Also, as many BASIS projects are beginning to have preliminary results, BASIS has begun to plan for larger outreach and dissemination events that synthesize lessons learned across projects. There are several such events planned for the coming fiscal year.

ISSUES

B A S I S

LIMITED CAPACITY FOR COMMUNICATIONS & OUTREACH ACTIVITIES

To date, communications activities have been primarily conducted by the Assistant Director in whatever time was available outside of general management and oversight responsibilities. To provide some minor assistance with the writing of briefs BASIS contracted an external editor on a per-brief basis and hired a temporary student assistant to help with some immediate website needs.

However, as the need for additional outreach became apparent, especially as BASIS-supported research began to have preliminary findings that warrant increased communications activities, it became increasingly apparent that a dedicated communications specialist was needed. To that end, BASIS initiated the hiring process in April, and selected and offered a candidate a position in September. She will be starting in early October 2015.

PERSONNEL CHANGES & DELAYS IN UC DAVIS HR RESPONSE

Gap with No Dedicated Financial Manager

Our previous financial analyst gave two weeks notice in mid-June 2015. A new account manager was not hired and able to start until September 2015. In the interim, all of our accounts were given to another departmental financial analyst who already had a full portfolio of projects. While this temporary analyst did the best she could to keep up with the requirements of BASIS, we fell behind on many management activities.

Hiring Delays

As described above with both the account manager and the communications specialist, the hiring process took longer than we would have hoped. We anticipated having both of these critical positions filled more quickly than was possible, which was largely the result of a severe backlog at the central UC Davis human resources office. As a result, this was completely out of our hands, and many activities that we hoped would be better maintained (or initiated) in this time period were delayed. Now that we are at full staffing, we are recovering and hope to have fully recovered from these gaps by late 2015.

FUTURE DIRECTIONS

B A S I S

INCREASED IDENTIFICATION, SYNTHESIS & DISSEMINATION OF FINDINGS

Now that the BASIS AMA Innovation Lab portfolio has been filled out and some projects are progressing to midline or even endline surveys, preliminary findings and more substantive results are expected over the next year. An essential part of our work over the next year will be increased synthesis of findings across projects, and communication of what has been learned about these important themes.

Some of the themes that we look forward to learning about in the coming year (and beyond) include:

- How different interventions – especially those encouraging the intensification of certain crops – affect women?
- How improved soil information impact use of improved inputs in smallholder agriculture?
- How can index insurance be structured to make it more effective in protecting smallholder farmers and unlocking opportunities for productive investments?

We will seek to increase our cross-project analysis and better communicate these broader lessons.

INCREASED STAKEHOLDER ENGAGEMENT

As most of our projects under our main award continue to progress and have preliminary or final results, we are increasingly turning our attention to improved dissemination of findings and lessons learned.

Increased engagement with USAID
Events (NBER & Mind the Gap)

ACCELERATED IMPLEMENTATION OF ASSOCIATE AWARDS

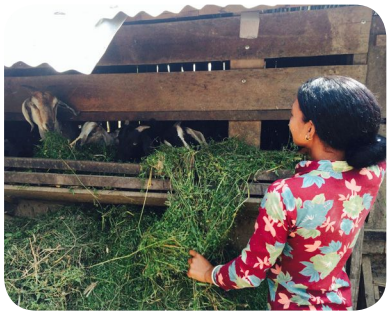
Both of the associate awards are, at this time, relatively early in their respective timelines.

SUCCESS STORY

2015

ASPIRATIONS & BEHAVIOR:
Developing a deeper understanding of hope and aspirations on decision-making

Hope is a powerful motivator, its absence detrimental to economic improvement. For the poor, aspirations for a better life are fixed within a vicious circle. Why plan for the future if you see no hope for improvement? Gloominess takes hold. If people are not able to imagine a better life for themselves and their children, they will not make attempts to increase their assets or save money for the future. Their focus remains fixed on getting through each day as it comes. Without efforts to increase income, however, or create a small safety net of savings, families remain trapped in poverty.



Research in Nepal indicates that observable assets (wealth) of others in a peer group are very important for an individual's own wealth aspirations.

If people are not able to imagine a better life for themselves and their children, they will not make attempts to increase their assets or save money for the future.

It is becoming increasingly clear that a deeper understanding of the role of "aspirations" is needed to help unravel the complex process of decision-making among impoverished families in their reluctance to save and invest in their future. Researchers can provide valuable insights in the design of interventions that address the source of the issue, not just the symptoms, and create lasting change. Already, two BASIS projects have considered the impact of hope and aspirations on the behavior and wellbeing of families in the developing world and have discovered useful information that may be able to guide and improve further research.

Lead Researchers

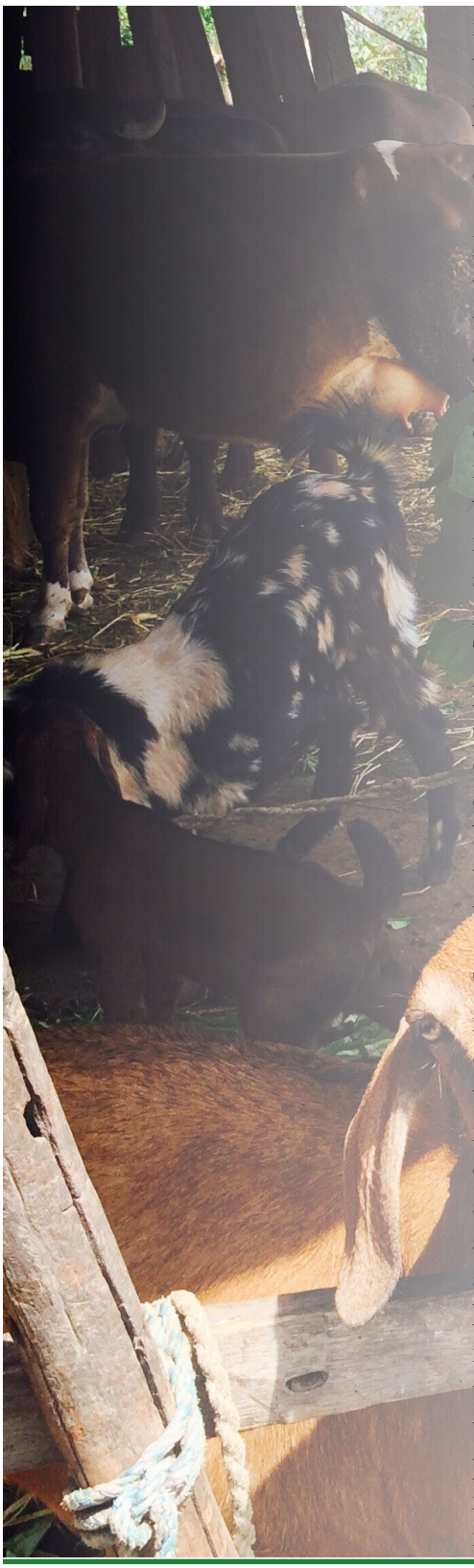
Rachid Laajaj, Paris School of Economics

Nicholas Magnan, University of Georgia

Sarah Janzen, Montana State University

Researchers in Mozambique discovered that an intervention designed to encourage savings led to a substantial reduction in "gloominess" and increase in farmer patience, or willingness to invest in their future.

The first research project, recently completed in Mozambique, included an assessment of a financial intervention in terms of behavioral benefits in addition to the standard economic impacts. In this study, farmers were given an agro-input subsidy and/or a matched savings account – the purpose of which was to encourage the development of a savings habit in order to carry forward the benefits of the outside financial assistance. Researchers discovered that not only did the subsidies help improve the economic prospects of many farmers, but perhaps more importantly, the interventions led to a substantial



reduction in "gloominess" and increase in farmer patience, or willingness to invest in their future. These results point out just how crucial it is to acknowledge that an economic intervention can affect asset accumulation both through its direct economic impact, and also through behavioral changes.

In the second project, as part of an impact evaluation of Heifer International's asset transfer program in Nepal, BASIS-funded researchers from the University of Georgia and the University of Montana developed a test of an aspirations failure theory. The research team's analysis suggested that the readily observable assets (wealth) of others in a peer group are very important for an individual's own wealth aspirations. On the other hand income, which is not as easily observable by outside peers, is not important for an individual's income aspirations. They also found support for the hypothesis that an "aspirations gap," the difference in your wealth and the perceived wealth of your peers, is a key element in what drives future-oriented behavior. Understanding how aspirations are developed could be key to designing interventions that are meant to encourage future-oriented behavior, such as savings and investments.

Understanding how aspirations are developed could be key to designing interventions that are meant to encourage future-oriented behavior, such as savings and investments.

This body of BASIS research is making important contributions to a growing body of literature that recognizes the potential significance of psychology in economic decision-making. A development intervention can try to create an economic impact, but as these two studies above show, significant changes can also be made through behavioral impact, including changing attitudes and aspirations. Effective development policies require structural changes that will outlive temporary interventions. For individuals to escape the poverty trap they must also change their behavior. Research that seeks to understand how and why behavior changes occur will lead to better designed policies that actually add significant value from incorporating behavioral effects. BASIS is optimistic that if these important new discoveries about behavioral effects, particularly surrounding the concepts of aspirations and hope for the future, are incorporated into policy and program design, then scaled economic interventions will offer more promise for promoting lasting change in the lives of those most in need.

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

USAID
FROM THE AMERICAN PEOPLE

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SUCCESS STORY

2015

LEARNING HOW FARMERS LEARN:
Closing the gap between farmer knowledge and methods to improve production and profitability

While the agricultural sector focuses on moving the technological frontier upward into realms of increasingly higher returns, producing superior yield seeds for example, there has been less of an emphasis on research to understand how to help farmers actually realize that maximum potential. Advancing the technological frontier will in the long run improve rural livelihoods and food security. However, most small farm yields fall well below what is possible with existing technologies. This signals the real need to better understand constraints to technology adoption. One such impediment is the growing knowledge gap that stands between farmers and their understanding of how best to intensify cultivation practices and improve production and profitability.

Examining how farmers learn and retain new information is a vital factor in determining the effectiveness and sustainability of future interventions.

BASIS researchers are testing new mechanisms to improve the smallholder farmer's knowledge and decision-making about the acquisition and deployment of advanced technologies in the hopes that we can raise the capacities and capabilities of smallholder farmers and bring increased productivity and food security to these vulnerable households. In particular, three BASIS research projects are looking into this topic more deeply. Training programs and time-limited input subsidies or capital are often used to overcome barriers to farmers' technology adoption. Yet how successful are these strategies in achieving sustainable long-term adoption of improved agricultural technologies, especially after these programs cease? Examining how farmers learn and retain new information is a vital factor in determining the effectiveness and sustainability of future interventions.

The first investigation is being undertaken in Ghana. There, smallholder farmers face significant obstacles to increasing their use of productive inputs, including an inadequate knowledge of the available fertilizers, application methods, and po-

BASIS researchers in Uganda discovered that improved farming practices resulting from the additional training remained unchanged a year and a half past the phase out of the intervention.

Lead Researchers

Chris Udry, Yale University

Stephen Smith & Ram Fishman, George Washington University

Michael Carter, University of California Davis

Dean Yang, University of Michigan

A project in Ghana is investigating ways in which information channels through Community Extension Agents can help overcome these difficulties; researchers have already a signficant increase in uptake of agricultural insurance.

tential yield results. This project is investigating ways in which information channels through Community Extension Agents (CEAs) can be improved to help overcome these difficulties. One tangible success already seen was that uptake on agricultural insurance product was increased significantly. These sales were supported by the "video van" that showed a video drama on the decision of whether or not to buy a drought insurance policy, which was enthusiastically received by the targeted communities.

In a second project, taking place in Uganda, researchers also identified information gaps as a clear barrier to adoption of improved technologies. Piggybacking on a program implemented by BRAC, which provided a network of model farmers and community agriculture promoters (CAPs) to train and educate farmers about new crop production techniques, and improved seeds and fertilizers. BASIS researchers discovered that improved farming practices resulting from the additional training remained unchanged a year and a half past the phase out of the intervention. While data analysis is still preliminary, this strongly suggests that farmer training appears to be sustainable.

Results from Mozambique suggest that a temporary voucher subsidy not only improved maize productivity, but that it also put voucher users on a transformational path.

In the last related project, BASIS researchers studied whether temporary input subsidies for technology adoption in developing countries can promote learning and lasting change. The key to determining whether provision of subsidies leads to long-term growth, even after the subsidies are no longer in effect, is to discover if farmer practices change fundamentally or whether these practices change only in direct reaction to the availability of subsidies. The project, undertaken in Mozambique, randomly assigned vouchers to farmers to purchase an improved technology package. Positive impacts only emerged in the following two post-subsidy years. Voucher-using households increased consumption by an average 36 percent over the control group. Results also indicate that the vouchers caused an increase in the production of crops other than maize in the post-voucher years. The pattern of these results suggest that the temporary voucher subsidy not only improved maize productivity, but that it also put voucher users on a transformational path.

Learning how best to harness the power of these learning channels is another promising way to make smart subsidies work even better.

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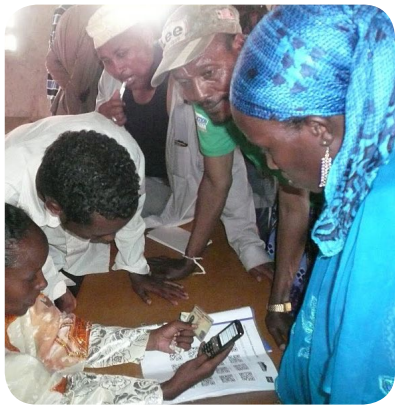
SUCCESS STORY

2015

SAFE MINIMUM STANDARDS:
Assessing Client Value fo Index Insurance

Index insurance is increasingly being promoted as an affordable alternative to conventional insurance in developing countries. And while studies show that this new type of insurance can be an incredibly powerful tool to help mitigate risks faced by struggling farmers and pastoralists, not all index insurance contracts are created equal. One contract may be designed in such a way to offer strong risk protection to farmers for a manageable price and stabilize their incomes in the case of severe weather stress. Another contract may be little more than a lottery ticket and can fail spectacularly to protect famers when shocks occur.



Studies show that index insurance can be an incredibly powerful tool to help mitigate risks faced by struggling farmers and pastoralists, but not all index insurance contracts are created equal.

Index insurance, well designed, helps to stabilize income flows and asset accumulation, allowing for the steady consumption and investment behaviors necessary to improve lives and move people upwards out of poverty.

The value of an insurance product for a smallholder farmer stems from the protection it offers on her consumption and assets. In the case of a shock, such as a drought, smallholder farmers may use costly coping strategies such as selling assets or eating less, which deplete physical and human capital (e.g. nutrition and education), jeopardize future consumption, and can be a very painful and traumatic experience. Index insurance, well designed, helps to stabilize income flows and asset accumulation, allowing for the steady consumption and investment behaviors necessary to improve lives and move people upwards out of poverty.

How, then, do we ensure that there is real value in an index insurance product for the farmer or pastoralist client? Unfortunately, this value is rarely assessed. Over the past year, however, BASIS/I4 researchers have been tackling this critical challenge to build a metric to measure index insurance quality that will help certify not only if a client would be better off with or without a particular index insurance contract but would further allow for the comparison of multiple insurance product options.

Lead Researchers

Quentin Stoeffler, University of California, Davis

Thomas Barre, University of California, Davis

Michael Carter, University of California, Davis

The BASIS team hopes that measures such as SMS, along with a bevy of other quality control mechanisms, will be incorporated into policy standards used to assess the value of the protection provided by insurance contracts.

There are several useful ways to measure the efficacy of an index insurance contract. Among them are: the cost of the premium, the probability of receiving a payout if a loss occurs, and the amount paid out. Now BASIS/I4 researchers are developing an innovative way to combine many of these measures to test whether an index insurance product will provide minimum value to farmers, meaning that the insurance product will not, at the very least, make the life of the farmer worse off.

Called Safe Minimum Standards (SMS), this tool allows contract designers to determine client "reservation price," or the maximum price that a farmer could pay for a contract so that their consumption and assets are not negatively affected. By ensuring that the market price for a commercialized index insurance product is equal to or, ideally, less than the farmer client reservation price, then the likelihood of the product causing more harm than good is greatly reduced.

Applying Safe Minimum Standards (SMS) to the design of index insurance contracts will help ensure that low quality products are not implemented on a broad scale.

Applying SMS to the design of index insurance contracts will help ensure that low quality products are not implemented on a broad scale. This is particularly important because index insurance contracts that do not provide client value will not only decrease demand for other products that could effect positive change, but will, in their implementation, fail to protect those most in need.

The BASIS team is at the forefront of this innovative research. It is our hope that measures such as SMS, along with a bevy of other quality control mechanisms, will be incorporated into policy standards used to assess the value of the protection provided by insurance contracts, and that guidelines will emerge to guide contract design and public investment in this promising financial innovation.

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