



FEED THE FUTURE

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

Innovation Lab for Peanut

Annual Report
Fiscal Year 2018

Feed the Future
Innovation Lab for Peanut
(Peanut Innovation Lab)

Annual Report – Fiscal Year 2018
(11 January 2018 – 30 September 2018)

Peanut Innovation Lab Management Entity
University of Georgia, Athens, Georgia
October 2018

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Director's Note

On behalf of the University of Georgia based management team, it is my pleasure to present the Feed the Future Innovation Lab for Peanut's Annual Report for FY18. The Leader with Associate Awards to provide funding for the Peanut Innovation Lab, as it is known by its short name, was signed between the University of Georgia and USAID on January 11, 2018. The award was for five years of funding at an initial commitment of \$14 million, with a total possible funding of \$35 million.

The University of Georgia was honored to be chosen to lead USAID's efforts in peanut research, and moved quickly to establish the management team by building on the existing team that successfully led the previous Feed the Future Innovation Lab on Peanut Productivity and Mycotoxin Control. The team was strengthened with the employment of a post-doctoral research associate to serve as the gender and youth expert.

An initial set of five commissioned projects were started shortly after the award. These were designed to provide important outputs to be used across many of the proposed competitive projects. Details on the progress in each of these projects are provided in this report. In one project on hermetic storage of shelled peanuts conducted by the USDA-ARS National Peanut Research Lab, results indicate a problem with germination using this storage system. If confirmed, this finding could impact storage systems for peanut seed in many countries. Other projects are focused on determining the diversity among the majority of peanut germplasm being used in Africa and on strengthening several African national program breeding programs to conduct and disseminate research.

As these projects began operations, two calls for proposals were conducted and have concluded with the identification of 15 competitive projects in the areas of varietal development and value-added gains along the peanut value chain. These projects are expected to be awarded by the end of 2018 or early 2019. Additional calls for proposals in nutrition, gender and youth are planned for first quarter of FY19 and to be awarded in early 2019.

During this startup year, the director, assistant director and gender/youth expert made several visits to research partners, conferences and other events in the USA and African countries, and participated in USAID Innovation Lab meetings in Uganda and the USA.

We believe we have developed an excellent portfolio of research projects, and are looking forward to next year as these get underway. We are confident that we will deliver the results that will help smallholder peanut farmers increase their productivity, quality and profitability of this important and nutritious crop. I hope you will subscribe to our newsletter and follow us on social media to stay abreast of the progress.

Dave Hoisington

Director

Executive Summary

The Feed the Future Innovation Lab for Peanut was established in January 2018 through a cooperative agreement between the U.S. Agency for International Development and the University of Georgia. Throughout FY18, the Innovation Lab worked to establish the new program, drafting documents such as the Performance Management Plan, Data Management Plan and Environmental Management and Mitigation Plan, as well as establishing an External Advisory Panel (EAP) and contracting with the company Piestar to create and maintain a data management system for the project.

A priority for the management entity was to recruit a Post-doctoral Research Associate to advise the innovation lab on issues related to gender and youth. Jessica Marter-Kenyon, a recent graduate of the University of California at Santa Barbara with experience in international development, joined the team in September.

Following approval of five commissioned projects, the innovation lab focused on competitive research projects. Requests for Proposals for two Areas of Inquiry (Varietal Development and Value-added Gains along the Value Chain) were released in March. Working with submitted concept notes for proposals, the EAP met in May to discuss and prioritize proposals; the management entity then requested full proposals from the PIs; and approved projects are expected to be announced by the end of calendar year 2018. One competitive project on genotyping of US peanut germplasm of African origin will receive joint funding from the Peanut Foundation, the research-focused organization funded by the entire US peanut industry .

RFPs for the other two Areas of Inquiry (Gender and Youth, and Nutrition) were released in May 2018, and concept notes reviewed by the EAP in September 2018. Full proposals were requested and will be reviewed in December 2018.

While most of the commissioned projects are only initiating activities, the project investigating the use of hermetic bags for storage of peanuts did complete its data acquisition phase during FY18. Preliminary analysis of the results indicated that storage of shelled peanuts in hermetic bags reduced germination to nearly zero after only a few weeks of storage. This has serious implications for the use of such storage system for peanut seed. Plans are underway to repeat the experiments to confirm the findings.

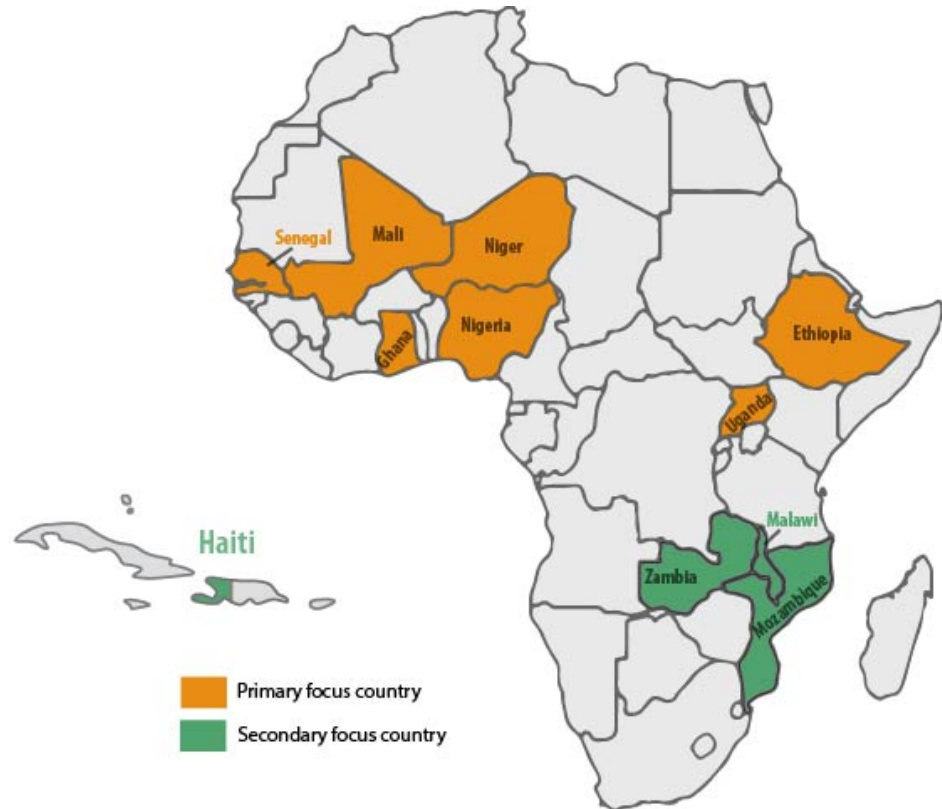
The other commissioned projects started activities such as assembling the lists of African varieties to be genotyped by SNPs, developing the survey tool for assessing the needs of peanut breeding programs, and determining the requirements for each breeding program to adopt the Integrated Breeding Platform's Breeding Management System (BMS) plant-breeding software. Final results from each of these projects are targeted in FY19.

Acronyms

AgDiv	Malawi Agricultural Diversification Activity
AOR	Agreement Officer's Representative
APRES	American Peanut Research and Education Society
ARS	Agricultural Research Service
AWARE	Advancing Women in Agriculture through Research and Education
BMS	Breeding Management System
CALS	College of Agriculture and Life Sciences, Cornell University, NY
CERAAS	Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse, Senegal
COMESA	Common Market for Eastern and Southern Africa
CRI	Crops Research Institute, Ghana
CSIR	Counsel for Scientific and Industrial Research, Ghana
DARS	Department of Agricultural Research Services, Malawi
EAP	External Advisory Panel
FY18	Fiscal Year 2018
FY19	Fiscal Year 2019
GAP	Good agricultural practices
GRD	Groundnut rosette disease
iAGRI	Innovative Agricultural Research Initiative
IBP	Integrated Breeding Platform
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IER	Institut d'Economie Rurale, Mali
IIAM	Instituto de Investigação Agrária de Moçambique, Mozambique
INRAN	Institut National de la Recherche Agronomique du Niger
ISRA	Institut Sénégalais de Recherches Agricoles, Senegal
ITRA	Institut togolais de recherche agronomique, Togo
ME	Management Entity
NARO	National Agricultural Research Organization, Uganda
NaSARRI	National Semi-Arid Resources Research Institute, Uganda
NCSU	North Carolina State University, NC
NPRL	National Peanut Research Lab, Dawson, GA
PI	Principal Investigator
PICS	Purdue Improved Crop Storage
PMIL	Peanut and Mycotoxin Innovation Lab
Ppb	Parts per billion
RFA	Request for Application
RFP	Request for Proposal
SARI	Savannah Agricultural Research Institute, Ghana
SNP	Single-nucleotide polymorphism
TSWV	Tomato spotted wilt virus
UGA	University of Georgia, GA
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VBA	Visual Basic for Applications
ZARI	Zambian Agricultural Research Institute, Zambia

Program Countries

The Peanut Innovation Lab works in countries where peanuts are an important source of food security, cash revenue and agricultural diversity.



Most peanut farmers in these countries:

- Farm less than two acres
- Use mainly manual labor and hand tools
- Produce yields of only 500 to 800 pounds per acre on average
- Are mostly women growing peanuts to feed their families
- Sell the remainder of what they grow in local markets for cash

The innovation lab's primary countries of focus are Senegal, Mali, Ghana, Niger, Nigeria Ethiopia, and Uganda. Secondary focus countries include Malawi, Mozambique, Zambia and Haiti.

Partners and collaborators may also be based in other countries strategically connected to focus countries.

External Advisory Panel

The External Advisory Panel is responsible for unbiased advice on technical matters within our portfolio of projects. This team of independent experts helps the management entity and USAID by identifying opportunities for partnerships, research portfolio gaps and solutions, and suggesting ideas for promoting the Peanut Innovation Lab program goals.

The External Advisory Panel met twice in FY18 to evaluate and discuss concept notes submitted for consideration of project funding under the innovation lab program.

Current External Advisory Panel members are:

- Martha Byanyima, Sanitary Phytosanitary and Agribusiness Expert, Common Market for Eastern and Southern Africa (COMESA), Uganda
- Darlene Cowart, Corporate Food Safety Director, Birdsong Peanuts, US
- Cynthia Donovan, Associate Professor, Agricultural Food and Resource Economics, Michigan State University, US
- Jeff Ehlers, Program Officer, Bill & Melinda Gates Foundation, US
- Andrew Emmott, Independent Consultant, UK
- Jeff Johnson, Retired President, Birdsong Peanuts, US
- Isaac Minde, Deputy Director, Innovative Agricultural Research Initiative (iAGRI), Tanzania, and Professor of International Development, Michigan State University, US
- Shyam Nigam, Expert Consultant in Agriculture for Development, India
- Helga Recke, Visiting Fellow-CALS-AWARE, Cornell University, US
- Farid Waliyar, Independent Consultant, Retired from ICRISAT in 2014, France

The Peanut Innovation Lab Director and Assistant Director, and the USAID Agreement Officer's Representative (Daniel Bailey) are *ex officio* members of the External Advisory Panel.

Program Activities and Highlights

Program management system

Following through on a decision to use program management software, the lab contracted with Piestar to design and implement systems to accept proposals, as well as manage projects for the life of the program. Piestar, a Kansas-based software company that specializes in systems for innovation labs, worked with ME staff throughout the year to set up and refine two systems:

- An RFX system facilitates requests for proposals – providing info to submitters, accepting concept notes, sorting and assigning proposals to members of the External Advisory Panel for review and allowing the ME to coordinate the solicitation process.
- The DPx system will facilitate management of selected projects throughout the life of the program, functioning as a single, central location for reporting updates to the ME, travel and purchase authorizations, publications based on findings and more.

Networking with industry

The Assistant Director was invited to participate in a workshop on post-harvest drying across various commodities organized by the Global Good Foundation in Bellevue, Washington and attended by specialists from three other innovation labs.

Several potential projects were identified for follow-up and a subsequent visit was arranged with the AOR. One project for continued research was identifying commercial alternative uses of contaminated products through insect remediation, specifically Black Soldier Fly larvae.

Another was on the particular requirements for moisture measurement of peanuts for calibration on an existing project being developed for Africa.

Presenting about the lab

While the ME gives regular updates to groups throughout the life of the program, the starting months are particularly important for educating people about the planned work of the Innovation Lab. Representatives of the Peanut Innovation Lab spoke to (among others):

- The Georgia Crop Improvement Program at the group's annual meeting in Athens;
- Faculty and administrators in the Department of Plant and Soil Sciences at Texas Tech University;
- Farmers and others at the opening session of the 2018 Georgia Peanut Tour in Savannah, Georgia; and
- Scientists gathered in Addis Ababa for the CGIAR Research Program Meeting on Grain Legumes and Dryland Cereals.

Co-creation of research projects

Following USAID's guidance on project co-creation, the Director and Assistant Director met with potential PIs and partners to hone proposed projects, bringing them more in line with program priorities, streamlining their efficiency and maximizing contacts the program has made in the past.

By bringing together the PI for a proposed value chain project in Ghana with collaborators, the Director was able to shape the project to have a clearer focus. That project will create and test

production packages paired with improved varieties to boost yield and quality for smallholder farmers in the peanut-growing north.

In other co-creation work, meeting with a PI on a genomics project to fight groundnut rosette disease, the Director was able to streamline the project to remove extraneous aspects, move testing closer to the field work and allow scientists more opportunity to focus on genotyping.

Key Accomplishments

The Innovation Lab began with five commissioned projects, which were able to leverage significant funds, including one project that was completed at no cost through a partnership with USDA-ARS, another that was included in a multilateral donor's project, and a third that had supporting funds offered by the Peanut Foundation, the US peanut industry check-off research organization. These cost savings were possible due to long-term relationships with research partners and industry, which assures that the research will be relevant and have impact.

A commissioned project on hermetic storage (PICS bags) for peanuts unexpectedly showed that the technology may have several negative trade-offs (including poor germination) and ought to be studied further. These results allow further research into the technology before it is scaled up and might prevent negative impacts.

The Innovation Lab was able to continue supporting ongoing regional collaborations from previously supported research and some in-country partnerships where USAID missions were targeting the peanut value chain, such as in Malawi.

A post-doc research associate in gender and youth research was appointed in September to provide expertise in these areas and social science research across the research portfolio.

Research Program Overview and Structure

The Peanut Innovation Lab contributes to the Global Food Security Strategy by increasing the production, sustainability and profitability of peanut production in targeted developing countries and the US. This will be achieved through research linkages between US and developing country scientists in four Areas of Inquiry: 1) improved peanut varieties, 2) increased value-added gains along the peanut value chain, 3) increased understanding of peanut consumption, and 4) increased understanding of gender and youth dimensions along the peanut value chain.

Area of Inquiry 1 (Improved Varieties) builds partnerships between peanut breeding programs in the US and target countries to use modern genomic and information technologies in the breeding programs. The objective is to enhance the capacity of peanut breeding programs in each country to develop new varieties using modern approaches, and to test and release varieties that increase yields and address the local, national and regional demands of the country.

Area of Inquiry 2 (Value-Added Gains) builds partnerships between the public and private sector, and establishes new partnerships in seed production and local processing. Research focuses on seed production of improved varieties, best management practices to optimize quantity and quality of the crop by smallholder farmers, and effective practices for harvesting, drying, storage and shelling.

Area of Inquiry 3 (Nutrition) uses linkages with the US Peanut Institute to assess the benefits of peanut-based foods for school feeding programs, impacts of peanut consumption on human microbiota and an assessment of the nutritive value of peanut products and cooking processes in Africa.

Area of Inquiry 4 (Gender and Youth) seeks a better understanding of the roles of gender and youth in peanut value chains in each target country based on scientific studies, and examples of gender-sensitive research products having impacts.

Program Partners

United States of America

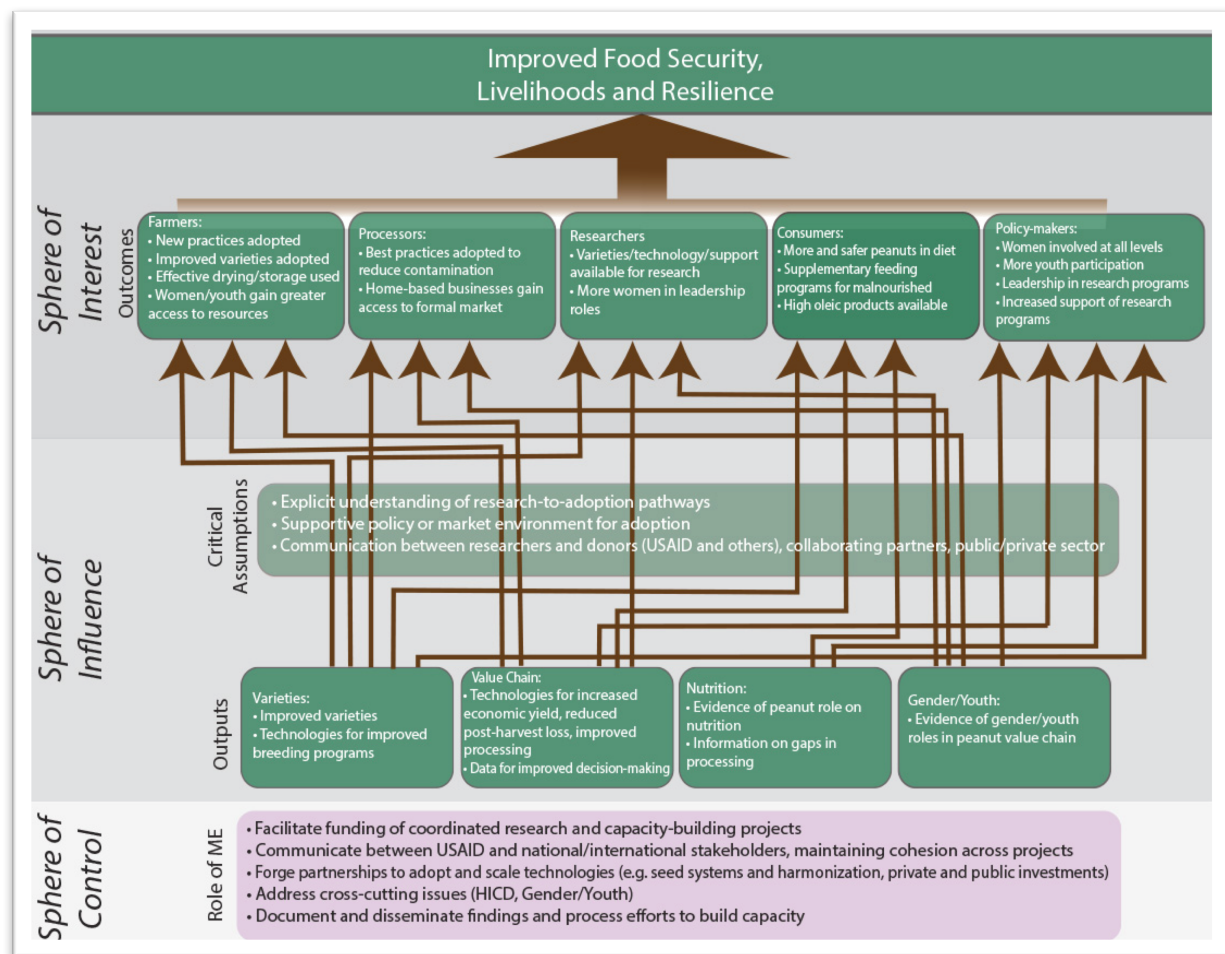
Institution	Department	City	State
University of Georgia	Department of Horticulture	Tifton	GA
United States Department of Agriculture-Agriculture Research Service (USDA-ARS)	National Peanut Research Laboratory (NPRL)	Dawson	GA
United States Department of Agriculture-Agriculture Research Service (USDA-ARS)	Market Quality & Handling Research	Raleigh	NC
North Carolina State University	Department of Crop and Soil Sciences	Raleigh	NC

Foreign

Institution	Department	City
Ghana		
Council for Scientific and Industrial Research (CSIR)	Crop Research Institute (CRI)	Kumasi
Council for Scientific and Industrial Research (CSIR)	Savannah Agricultural Research Institute (SARI)	Tamale
Malawi		
Department of Agricultural Research Services (DARS)	Chitedze Research Station	Lilongwe
Mexico		
Integrated Breeding Platform (IBP)		Mexico City
Mozambique		
Instituto de Investigação Agrária de Moçambique (IIAM)	Northeast Zonal Center	Nampula
Senegal		
Institut Sénégalais de Reserches Agricoles (ISRA)	Centre National de Recherches Agronomiques (CNRA)	Bambey
Institut Sénégalais de Reserches Agricoles (ISRA)	Centre d'étude régionale pour l'amélioration de l'adaptation à la sécheresse (CERAAS)	Thies
Uganda		
National Agricultural Research Organization (NARO)	National Semi Arid Resources Research Institute (NaSARRI)	Soroti
Zambia		
Zambia Agriculture Research Institute (ZARI)		Chipata

Theory of Change and Impact Pathway(s)

The main objective of the Peanut Innovation Lab is to support research that leads to the increased production, sustainability and profitability of peanuts in targeted developing countries. This objective will be met through joint research and capacity building between US and developing country partners. Ultimately, the results are a part of the US government goals as defined under the Global Food Security Strategy. *(Shown full size in Appendix)*



Research Project Reports

The following five projects were awarded in FY18 based on proposals submitted to USAID as part of UGA's application in response to the USAID Notice of Funding Opportunity. All projects are for up to one year, and will be completed during FY19. Progress during the first few months is presented below for each project.

Project	PI	Lead Institution
Technical evaluation of PICS bags for use with shelled peanuts	Chris Butts	USDA-ARS
Breeder seed production and assessment of breeding programs capacity building needs in targeted African countries	David Okello	NARO
Adoption and implementation of digital data management system and analytical pipeline by groundnut-breeding programs in Malawi, Mozambique and Zambia	David Okello	NARO
Genotypic analysis of peanut germplasm using the Axiom_Arachis2 SNP array	Peggy Ozias-Akins	UGA
Modification of NCSU Risk Index Tool for North Carolina and Developing a Risk Tool Template for Peanut Innovation Lab Target Countries	David Jordan	NCSU

Technical evaluation of PICS bags for use with shelled peanuts

PI: Dr. Chris Butts, USDA-ARS, National Peanut Research Lab, Dawson, GA

Co-PI: Lisa Dean, USDA-ARS, Market Quality Handling Research, Raleigh, NC

This project compared the quality of peanuts stored in conventional jute bags to peanuts stored in hermetic PICS II bags.

Achievements

Shelled peanuts in samples of 50 to 60 pounds were placed in either burlap or PICS bags and stored for 301 days. Quality was measured five times – at the start and after 67, 159, 249, and 301 days of storage. Temperature was maintained between 65 degrees and 80 degrees F.

Quality parameters measured were moisture content, aflatoxin concentration, seed germination, percent free fatty acid, peroxide value, and sensory attributes (when possible).

The average germination for all peanuts at the beginning of the study was 77%. Maximum germination for peanuts stored in burlap was 81% after 159 days of storage decreasing to 19% after 301 days of storage.

The initial germination rate of 77% gradually decreased to 2% for the peanuts in the PICS bags. A white powdery mold was observed in the hermetically stored peanuts after the first 67 days and has tentatively been identified as a *Eurotium* species. No live insects were found in the hermetically stored peanuts. Severe infestations of insects, primarily Indian meal moth, were observed in the burlap bags.

Throughout the study, aflatoxin contamination remained below detectable limits (< 2 ppb). After 301 days of storage, 2 samples had aflatoxin more than 2 ppb. One sample from the burlap

measured 75 ppb and was one of the bags that had gotten wet due to a leak in the dome. A second sample stored in one of the PICS + VAC treatment had 12 ppb aflatoxin.

The sealed bags were placed in the same small monolithic concrete dome.

Capacity Building

None

Lessons Learned

Germination appears to be impacted by storage in hermetic bags. While the germination rate dropped for both samples, the change was more dramatic in PICS bags than in burlap.

Presentations and Publications

Expected in the future, but not complete at report time.

Breeder seed production and assessment of breeding programs capacity building needs in targeted African countries

PI: David Okello Kalule, NARO, Uganda

Co-PIs: James Asibou, CSIR-CRI & Richard Oteng Frimpong, CSIR-SARI, Ghana;
Justus Chintu, DARS, Malawi; Issa Faye, ISRA & Daniel Fonceka, CERAAS, Senegal;
Lutangu Makweti, ZARI, Zambia; Amade Muitia, IIAM, Mozambique

The main objectives are to produce sufficient breeder and foundation seed of improved varieties for use in seed systems partnerships, and collectively to assess and prioritize needs to enhance each national peanut breeding program in the target countries for the Peanut Innovation Lab.

Achievements

The project was launched with a meeting 28-31 May, 2018 in Kampala, Uganda, attended by co-PIs (groundnut breeders from Ghana, Malawi, Senegal, Mozambique and Zambia), as well as the innovation lab management team (Dave Hoisington and Jamie Rhoads) and a Seeds2B representative. Specific activities include:

- Signing a subaward with NARO and transferring funds to NaSARRI, Serere
- Completing a needs assessments (Infrastructure, personnel, etc.) for the breeding programs
- Holding a planning and breeding program needs-assessment meeting at Silver Springs Bugolobi in Kampala, Uganda
- Identifying varieties for multiplication

Capacity Building

The project was launched with a meeting 28-31 May, 2018 in Kampala, Uganda, attended by co-PIs (groundnut breeders from Ghana, Malawi, Senegal, Mozambique and Zambia), as well as the innovation lab management team (Dave Hoisington and Jamie Rhoads) and a Seeds2B representative. Specific activities include:

Lessons Learned

None

Presentations and Publications

None

Adoption and implementation of digital data management system and analytical pipeline by groundnut-breeding programs in Malawi, Mozambique and Zambia

PI: David Okello Kalule, NARO, Uganda

Co-PI(s): Justus Chintu, DARS, Malawi; Lutangu Makweti, ZARI, Zambia;
Amade Muitia, IIAM, Mozambique; Graham McLaren, IBP.

The project aims to improve the efficiency of plant breeding programs in target countries by enabling plant breeders to access a modern analytical pipeline, breeding technologies/materials and related information in a centralized, integrated and practical manner, to better deliver improved varieties that meet local farmers' needs and market demand.

Achievements

The project was launched on 28 May 2018, with a three-day workshop attended by the IBP team (Jean-Marcel, Alioune M, Graham McLaren, Mable Mulanya, and Esther Achola), and innovation lab management team (Dave Hoisington and Jamie Rhoads).

Other specific accomplishments include:

- Identified IT needs and developed BMS implementation plans at the country level
- Agreed where (Uganda) and when to hold the first BMS-use training workshop
- Subaward signed with NARO and money transferred to NaSARRI, Serere

Capacity Building

BMS training was conducted with breeders and technicians 23-26 October 2018.

Laptop computers, wi-fi routers and barcode printers were provided to co-PIs for operating the BMS in their home countries

Lessons Learned

Social media can be used to build teams. East African groundnut breeders have had success communicating and coordinating through a WhatsApp group.

Presentations and Publications

None

Genotypic analysis of peanut germplasm using the Axiom_Arachis2 SNP array

PI: Peggy Ozias-Akins, University of Georgia

Co-PI(s): Daniel Fonceka, CERAAS (within ISRA, Senegalese Institute for Agricultural Research)

The SNP array, recently created by a project led by the PI, contains 30,539 SNPs useful for cultivated peanut and is now available at a reasonable price per sample. It already has been used to genotype several recombinant inbred line populations segregating for nematode, TSWV, late leaf spot, white mold resistance and seed traits, as well as a set of genotypes used to screen for aflatoxin contamination susceptibility. Genotyping diverse germplasm relevant to the Peanut Innovation Lab would allow breeders to take advantage of the latest genetic technologies in groundnut to: catalog genetic diversity among breeding materials, identify genomic regions under positive or negative selection or alleles fixed in a breeding program, enable genome-wide background selection, identify a subset of polymorphisms to be developed for single-marker analysis for specific traits, and construct genetic maps of populations segregating for traits of interest.

Achievements

The following breeding programs contributed lines (receipt of 300 lines from ICRISAT, Nairobi is still anticipated). The primary instruction given to breeders in each country was to select the lines most important to their breeding program. Nevertheless, the importance of ICRISAT-derived lines to African national peanut breeding programs is particularly important to point out as those lines represent more than 40% of the material sent by breeders.

Institution	Country	# Lines
ISRA	Senegal	181
DARS	Malawi	98
IIAM	Mozambique	101
ZARI	Zambia	52
CSIR-SARI; CSIR-CRI	Ghana	182
ITRA	Togo	100
NaSARRI	Uganda	216
IER	Mali	102
INRAN	Niger	100
TOTAL		1132

Plant materials were sown gradually as received by CERAAS in Senegal starting in mid-July. All plants are being grown in a screenhouse in Senegal for single-seed descent and will be harvested gradually starting from the end of October. Overall, good germination has been observed in the collection although some seeds, particularly those originated from Ghana failed to germinate. DNA samples from leaf materials for up to 800 lines are already extracted at CERAAS and the extraction for the remaining samples is ongoing. The extracted DNA samples will be sent to UGA for genotyping while the peanut seeds will remain in Senegal.

Capacity Building

Aissatou Sambou, a Borlaug Fellow who completed her PhD with co-PI Daniel Fonceka, spent three months at UGA learning how to obtain and interpret data from the Affymetrix array and to analyze and visualize it with the Axiom Analysis Suite and custom scripts.

Lessons Learned

International materials exchange can be slow to navigate. Breeders rarely have comprehensive information for all genotypes (subspecies/variety/market type; generation; plant growth habit; estimated maturity; disease resistances; flower color; 100 seed weight; and seed coat color.

Presentations and Publications

None

Modification of NCSU Risk Index Tool for North Carolina and Developing a Risk Tool Template for Peanut Innovation Lab Target Countries

PI: David Jordan, North Carolina State University

Co-PI(s): Gail Wilkerson, Rick Brandenburg, and Barbara Shew, NCSU

The main objective is to modify the North Carolina State University (NCSU) risk index software tool (<https://agroclimatenc.ncsu.edu/peanut/riskmgmt/>) for use in other US states and Peanut Innovation Lab countries to aid farmers and their advisors in making informed decisions on the best options for production practices, including disease and pest management. The tool currently is designed specifically for North Carolina peanut industry.

The framework used by the current web-based North Carolina peanut risk decision tool was put into a Microsoft Excel workbook. The first worksheet within the workbook serves as the user interface for the risk decision tool. This worksheet, much like the current web-based version, allows users to select management practices and see how pests might impact yield based on those decisions. The second worksheet contains management decisions, such as varieties, rotations, tillage, irrigation, plant density, and pesticide application. When risk-factor data is placed into the worksheet, it creates a calculator tailored to a certain geographic area.

A user then can put specific information – such as irrigation – into this calculator, and the tool calculates the associated risk of pest damage. A user form has been created to assist developers in creating and populating a pest worksheet. Finally, several VBA macros (shortcuts that automate spreadsheet functions) have been written to facilitate data entry and risk calculations.

Future work includes the development of additional user forms and macros to assist in data handling and input, the addition of weed risk, and incorporating economic risk.

Lessons Learned

None

Capacity Building

None

Publications

None

Human and Institutional Capacity Development (HICD)

Long-term training

Name	Gender	Country	Degree	Grad date	Discipline	Focus	Mentor	Institution
Esther Achola	F	Uganda	PhD	2022	Plant breeding/genetics	Groundnut Rosette Disease	David Okello	Makerere University

Innovation Transfer and Scaling Partnerships

The Peanut Innovation Lab has continued several relationships established under the Peanut & Mycotoxin Innovation Lab to establish a pipeline for continued scaling of technologies. The primary example of scaling activities is the subaward from the Malawi Agricultural Diversification Activity (AgDiv) funded by the USAID mission in Malawi and managed by the Paladium Group.

The ME is managing this subaward with four primary objectives that align with the overall Peanut Innovation Lab objectives, including testing and scaling of Good Agricultural Practices (GAP), Cost-Benefit Analysis of various technical packages for both peanut and soy, an extensive training program related to the tobacco diversification strategy for smallholder tobacco farmers, and support for the national program breeder, Justus Chintu, at the Department of Agriculture Research Services to expand variety evaluation program and seed production of breeder and foundation seed. The project is being implemented with NCSU scientist Rick Brandenburg for the GAP evaluation and training objectives and with University of Connecticut economist Boris Bravo-Ureta. Both are continuing to build upon relationships established during PMIL.

Management Entity

The management entity is housed at the University of Georgia at Athens, within the College of Agricultural and Environmental Sciences' Office of Global Programs.

The staff is made up of:

- Dave Hoisington, Director
- Jamie Rhoads, Assistant Director
- Allen Stripling, Business Manager
- Allison Floyd, Communications Coordinator
- Bonnie Klostermann, Administrative Specialist
- Jessica Marter-Kenyon, Post-doctoral Research Associate on Gender and Youth

The Director and Assistant Director hold research faculty positions in the Crop and Soil Sciences Department, while the gender and youth researcher holds a joint appointment with UGA's Department of Agricultural Leadership, Education & Communication. The Administrative Specialist is a shared

position with the Office of Global Programs. Other departments within the university, especially the Office of Sponsored Programs and the Contracts and Grants Division, further support the team.

The management entity conducted, participated in or presented at various meetings in the US and abroad through the year, including:

- Meeting with Palladium Ltd. (implementing partner for the USAID Agricultural Diversity Activity in Malawi) and USAID, Washington, DC, Jan. 29-Feb. 2 (Hoisington, Rhoads)
- Meeting with Faith Tarr (USAID) to present Peanut Innovation Lab, Addis Ababa, Ethiopia, 13 Feb (Hoisington)
- CGIAR Research Program Meeting on Grain Legumes and Dryland Cereals, Addis Ababa, Ethiopia, 14-16 Feb (Hoisington)
- Visit David Okello to discuss proposed commissioned projects in Kampala, Uganda. Also met with Simon Byabagambi (USAID) along with David to discuss Peanut Innovation Lab in Uganda, 17 Feb (Hoisington)
- Bill & Melinda Gates Foundation's Jeff Ehlers and Vicki Wilde to discuss proposed breeding/genomics projects, as well as gender and youth ideas, Seattle, WA, 26 Mar (Hoisington, Rhoads)
- Global Good to discuss ideas for aflatoxin detection, Seattle, WA (Rhoads, Hoisington)
- Texas Tech University for presentation on Peanut Innovation Lab, Lubbock, TX, 27 Mar (Hoisington)
- EAP proposal review, Eatonton, GA, 7-9 May (Management Entity)
- Innovation Lab Directors, Protea Hotel, Kampala, Uganda, 21-27 May (Hoisington, Rhoads)
- African Peanut Breeders Meeting, Kampala, Uganda, 28-31 May (Hoisington, Rhoads)
- AgDiv partners, Lilongwe, Malawi, 4-6 June (Hoisington, Rhoads)
- APRES, Williamsburg, Va., 9-13 July (Hoisington, Rhoads, Floyd)
- Meeting with co-creators on production practices project, sites in Ghana, Aug. 5-18 (Hoisington)
- Innovation Lab Directors Annual Meeting, Washington, DC, 10-11 Sep (Hoisington, Rhoads, Marter-Kenyon)
- EAP Meeting, Savannah, Ga., 17-18 Sep (Management Entity)
- Georgia Peanut Tour, Savannah, Ga., 19-20 Sep (Management Entity)

Communications

The Peanut Innovation Lab was able to capitalize on the communications outlets used by the PMIL. Branding, social media accounts, website information and brochures were developed to highlight the new program.

A Peanut Innovation Lab digital newsletter was issued each month to more than 400 subscribers.

Success Stories

Groundnut breeders build common platform

A group of African peanut breeders has formalized their professional network through the Peanut Innovation Lab and started work to connect their findings in a way that will benefit science across the continent.

The acquaintances met through networking at project meetings and professional conferences and built a strong network through social media, particularly the program WhatsApp. Through the Feed the Future Innovation Lab for Peanut they have formalized that relationship and are working to implement a common software that will allow them to collaborate into the future.

In the past, the collaborating scientists studied through or worked with an innovation lab or the precursor collaborative research programs funded through USAID. With support from Feed the Future's Peanut & Mycotoxin Innovation Lab, which ran from 2012 to 2017, this small group of peanut breeders from eastern and southern Africa crossed paths multiple times and began to share knowledge and germplasm.

So, when the new Peanut Innovation Lab started work, one of the first commissioned projects involved formalizing this partnership and enabling the breeders to work together through state-of-the-art management software.

In spring 2018, collaborators met in Uganda to kick off a pair of projects to strengthen the coalition. The two commissioned projects are headed by David Kalule Okello, who leads Uganda's peanut breeding program through the National Agricultural Research Organisation.

Within a year, the projects will bring [Integrated Breeding Platform's](#) Breeding Management Software to the national programs in Mozambique, Malawi and Zambia. The software, which Okello adopted six years ago, will give the breeders a comprehensive tool to manage trials, nurseries and seed inventory, run statistical analyses, and make breeding decisions through the gradual integration of genetic markers. Rather than keep data in stack of papers on a clipboard – or even a folder of Excel

spreadsheets on a computer drive – the system allows users to store data in the cloud where the team can collaborate, the records are safe from natural disaster and data grows season after season. It also reduces errors inherent in hand-collected data.



Peanut breeders in several African nations formalized a professional network through the Peanut Innovation Lab. Here, Issa Faye, Daniel Fonceka, Jamie Rhoads, Dave Hoisington, Lutangu Makwete, David Kalule Okello, James Asibuo, Richard Frimpong, Justus Chintu and Amade Muitia meet in Kampala near the start of a project to begin using a common breeding management computer platform.

Working with the Peanut Innovation Lab, the collaborators can focus on traits of interest across the continent – such as resistance to groundnut rosette disease (GRD) or increased climate resilience – and improve their efficiency and potential for success by sharing germplasm in the African core peanut subset representing the diversity of peanuts in Africa.

While the scientists are working together on the commissioned projects, most are also part of projects proposed in competitive bids to the Peanut Innovation Lab.

In addition to Okello, the co-PIs include Justus Chintu of the Department of Agricultural Research Services in Malawi; Amade Muitia from the Mozambique Agricultural Research Institute (IIAM); and Lutangu Makweti of the Zambia Agricultural Research Institute.

Appendix A. List of Awards to Partners

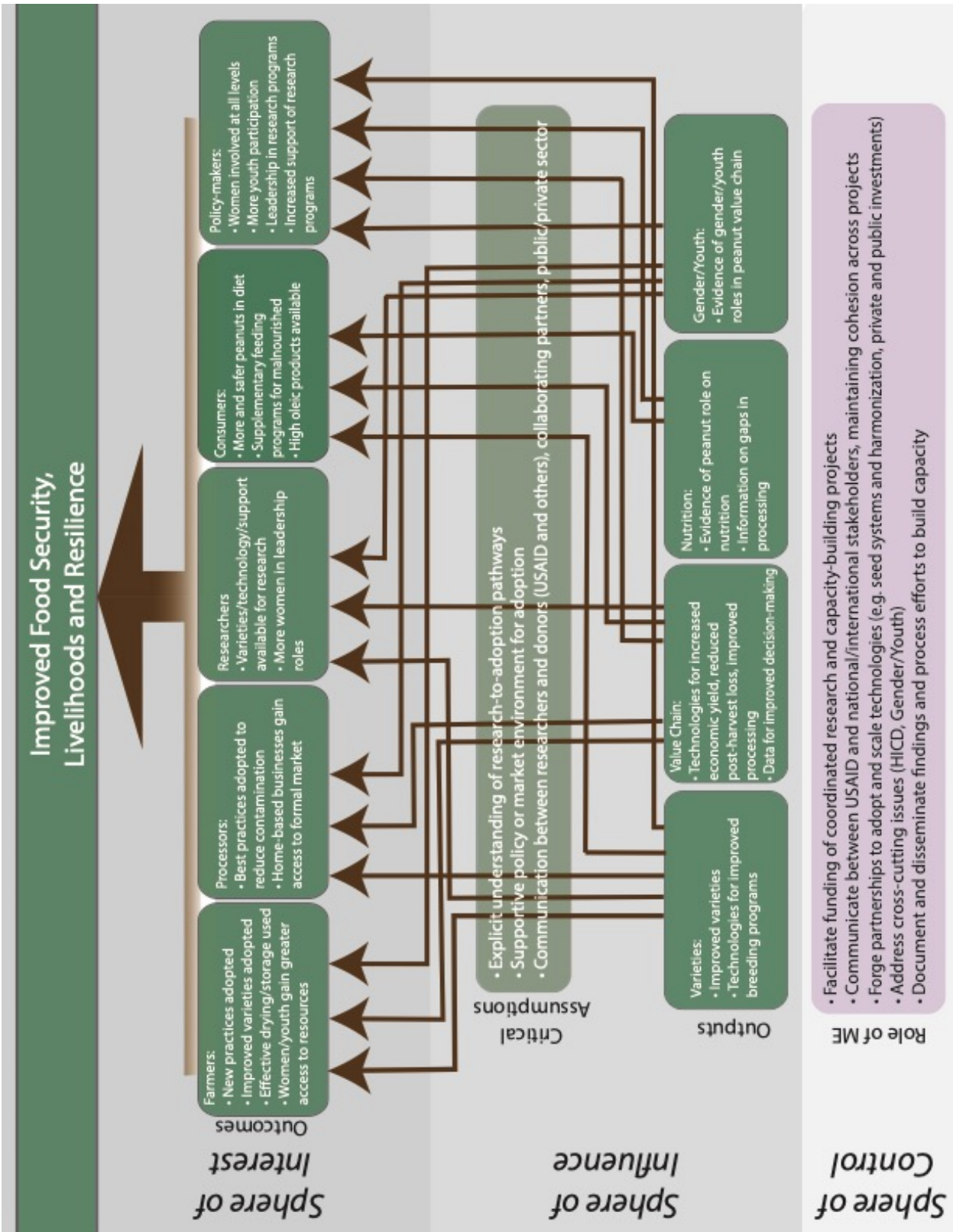
US Partners (by State)

Institution	Project Name	Start Date (mm/dd/yy)	End Date (mm/dd/yy)	FY18 Budget	Total Budget
Georgia				\$68,250	\$160,020
University of Georgia (UGA)	Genotypic analysis of peanut germplasm using the Axiom-Arachis2 SNP array	5/1/18	4/30/19	\$68,250	\$160,020
USDA-ARS, National Peanut Research Lab	Technical evaluation of PICS bags for use with shelled peanuts	5/1/18	1/30/19	\$0	\$0
North Carolina				\$40,805	\$79,190
North Carolina State University (NCSU)	Developing a risk tool template	5/1/18	4/30/19	\$40,805	\$79,190

Non-US Partners (by Country)

Institution	Project Name	Start Date (mm/dd/yy)	End Date (mm/dd/yy)	FY2016 Budget	Total Budget
Uganda				\$206,910	\$229,900
NARO-National Semi-Arid Resources Research Institute (NaSARRI)	Breeder seed production and assessment of breeding programs capacity building needs in targeted African countries	5/1/18	4/30/19	\$83,160	\$92,400
NARO-National Semi-Arid Resources Research Institute (NaSARRI)	Adoption of digital breeding data management system in targeted African countries	5/1/18	4/30/19	\$123,750	\$137,500

Appendix B. Impact Pathways (full size)



This Annual Report (covering Fiscal Year 2018 which ended September 30, 2018) is a publication of the Feed the Future Innovation Lab for Peanut, also called the Peanut Innovation Lab.

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