

PARTNERING FOR IMPACT: LEVERAGING FEED THE FUTURE INNOVATION
LABS TO ACHIEVE THE U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT'S
FOOD SECURITY OBJECTIVES AT THE MISSION LEVEL

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TABLE OF CONTENTS

<i>Executive Summary</i>	6
<i>Part 1: Background of USAID</i>	7
1.1 History	7
1.2 USAID's Mission	8
1.3 Feed the Future	9
1.4 Global Food Security Strategy	10
1.5 Global Food Security Research Strategy	11
1.6 USAID Programming Pathway: Centrally Funded Mechanisms	12
1.6.2 USAID Bureau for Resilience and Food Security Research Portfolio	12
1.6.2.1 Background of Collaborative Research Support Programs and Innovation Labs	13
1.6.3 USAID Mission Portfolios	14
1.7 Partnering for Impact	14
<i>Part 2: Case Studies</i>	15
2. USAID Mission to Malawi's Collaboration with the Feed the Future Innovation Lab for Peanut Research	15
2.1 Context: Malawi's Tobacco Industry	15
2.2 Project Justification	17
2.3 Malawi Mission Solicitation for the Feed the Future Malawi Ag Diversification Activity	20
2.5 Malawi Ag Diversification Activity Awarded	21
2.6 AgDiv Collaboration with the Feed the Future Peanut Innovation Lab	21
3. USAID Mission to Guatemala's Associate Award to the Feed the Future Innovation Lab for Collaborative Research on Grain Legumes	28
3.1 Context: Guatemala's Western Highlands History	28
3.2 Project Justification	30
3.3 Guatemala Mission Solicitation	32
3.4 Feed the Future Legume Systems Innovation Lab Overview	33
3.5 Legume Systems Innovation Lab MásFrijol Project Proposal Overview	33
3.6 MásFrijol Project Awarded	35
3.7 MásFrijol Project Components	35
3.8 MásFrijol Results	36
<i>Part 3: Observations and Recommendations</i>	38
4.1 Additional Insights	40

LIST OF ACRONYMS

- (AA) Associate Award
- (AgDiv) Feed the Future Malawi Agriculture Diversification Activity
- (AOR) Agreement Officer Representative
- (BFS) Bureau for Food Security
- (CBA) Cost-benefits analysis
- (CRSPs) Collaborative Research Support Programs
- (DARS) Department of Agricultural Research
- (FISP) Farm Input Subsidy Program
- (FTF) Feed the Future
- (FTFIL) Feed the Future Innovation Lab
- (GFSS) Global Food Security Strategy
- (GFSRS) Global Food Security Research Strategy
- (IL) Innovation Lab
- (ICRISAT) International Crops Research Institute for the Semi-Arid Tropics
- (LLTC) Limbe Leaf Tobacco Company
- (MSU) Michigan State University
- (PICS) Purdue Improved Cowpea Storage
- (PIL) Feed the Future Peanut Innovation Lab
- (PMIL) Feed the Future Mycotoxin Innovation Lab
- (PRIL) Feed the Future Innovation Lab for Peanut Research
- (RFAAP) Request for Associate Award Proposal
- (RFP) Request for Proposal
- (RFS) Bureau for Resilience and Food Security
- (ToT) Transfer of Technology
- (USAID) United States Agency for International Development
- (WHIP) Feed the Future Western Highlands Initiative Program
- (ZARI) Zambia Agriculture Research Institute
- (ZOI) Zone of Influence

Executive Summary

Over the past decade, the U.S. government's flagship global hunger and food security initiative, Feed the Future, has helped over 23 million people escape poverty by promoting agricultural growth, resilience, and nutrition.¹ Research and innovation are crucial for achieving these goals; however, widespread impact requires adopting and scaling appropriate technologies. To do so, the United States must facilitate collaboration between centrally-funded Feed the Future Innovation Labs (FTFILs) and field-based U.S. Agency for International Development (USAID) Missions to develop context-specific solutions that meet the needs of the target population.

This report takes a case-study approach to examine two successful instances of coordination between USAID Missions and FTFILs. The analysis aims to understand the factors contributing to two successful collaborations and offer insight into increasing the impact and scaling of Feed the Future-funded innovations through strategic engagement between USAID Missions and FTFILs. Presently, there is not an effective strategy for fostering collaboration between FTFILs and USAID Missions, leading to missed opportunities in innovation adoption, scaling, and impact in USAID's Zone of Influence (ZOI). This report recommends (1) encouraging Missions to leverage Innovation Lab expertise through Associate Awards, (2) requiring Mission Implementing Partners to collaborate with Innovation Labs to produce contextually relevant research outputs, and (3) strategically engaging with Missions regarding Innovation Lab research streams.

¹ Feed the Future: About (2023). Retrieved April 5, 2023, from <https://www.feedthefuture.gov/about/>

Part 1: Background of USAID

1.1 History

The United States Agency for International Development (USAID) is a U.S. federal government agency established under President John F. Kennedy through the Foreign Assistance Act of 1961. USAID's origins can be traced to the post-World War II era when the U.S. government, through the Marshall Plan, provided financial aid and technical assistance to Europe to rebuild infrastructure, strengthen the economy, and promote regional stability. Upon completing the Marshall Plan, the U.S. government continued providing development aid through government agencies, including the Mutual Security Agency and the Foreign Operations Administration. On November 3, 1961, the U.S. government formally affirmed its commitment to supporting international development and combined its foreign assistance efforts into a single agency responsible for administering development aid to foreign countries through the establishment of the U.S. Agency for International Development.²

Historically, USAID's mission has centered around promoting stability and reducing poverty by supporting economic growth, health, agriculture, education, and democracy in low and middle-income countries. Although USAID's approach has evolved, from focusing on "basic human needs" in the 1970s to assisting in the rebuilding of Iraq and Afghanistan in the 2000s, USAID has remained steadfast in its commitment to

² USAID History: About Us. USAID. (2023, February 10). Retrieved February 29, 2023, from <https://www.usaid.gov/about-us/usaaid-history>

supporting those who are struggling to make a better life, recovering from a disaster, or striving to live in a free and democratic country.³ Today, USAID remains a prominent bilateral donor, working with host governments, non-government organizations (NGOs), the private sector, and other organizations to support countries in achieving their development goals.

1.2 USAID's Mission

“On behalf of the American people, we promote and demonstrate democratic values abroad, and advance a free, peaceful, and prosperous world. In support of America's foreign policy, the U.S. Agency for International Development leads the U.S. Government's international development and disaster assistance through partnerships and investments that save lives, reduce poverty, strengthen democratic governance, and help people emerge from humanitarian crises and progress beyond assistance.”⁴

Today, USAID operates in over 100 countries with an FY23 budget of over \$49 billion USD.⁵ USAID continues to provide financial assistance and technical expertise to promote economic development, democracy, and humanitarian aid while advancing U.S. foreign policy interests.

³ Ibid

⁴ USAID, 2022. Mission, Vision, and Values: About Us. Retrieved February 29, 2023, from <https://www.usaid.gov/about-us/mission-vision-values>

⁵ USAspending.gov. (n.d.). USAID Agency Profile. Retrieved March 24, 2023, from <https://www.usaspending.gov/agency/agency-for-international-development?fy=2023>

1.3 Feed the Future

Launched in 2010 under the Obama Administration, Feed the Future is the U.S. government's flagship global hunger and food security initiative. Feed the Future was created in the wake of the 2007-2008 global food price crisis, which severely impacted the world's most vulnerable populations.⁶ Feed the Future was formalized via the enactment of the Global Food Security Act in 2016, which provided a legislative foundation for Feed the Future's work. The initiative currently includes 20 target countries across Africa, Asia, the Caribbean, and Latin America and is based on a partnership between the U.S. government, other donor countries, private sector companies, and civil society organizations.⁷

Feed the Future takes a comprehensive approach to address food security, focusing on increasing food production, improving food quality and diet diversity, reducing food waste and post-harvest losses, and addressing the causes of malnutrition and stunting. Additionally, it emphasizes gender equality and women's empowerment, recognizing that women play a critical role in agriculture and food security but often face significant barriers to accessing agricultural inputs, extension services, and financing. Feed the Future represents a considerable commitment by the U.S. government to combat global hunger and poverty and to promote sustainable agricultural development and food security in some of the world's most vulnerable areas.

⁶ Feed the Future: About (2023). Retrieved April 5, 2023, from <https://www.feedthefuture.gov/about/>

⁷Ibid

1.4 Global Food Security Strategy

The Global Food Security Strategy (GFSS) is an integrated whole-of-government approach to addressing the challenges related to global food security through agency-specific implementation plans that are required by the Global Food Security Act of 2016.⁸ The GFSS aims to end global hunger, poverty, and malnutrition by implementing the Feed the Future initiative. Launched in 2016 and updated in 2022, the GFSS outlines a multi-sectoral approach to improving food security, nutrition, and resilience in developing countries.

The GFSS contains three overarching objectives:

- 1) Inclusive and sustainable agriculture-led economic growth
- 2) Strengthened resilience among people, communities, countries, and systems
- 3) A well-nourished population, especially among women and children⁹

The GFSS recognizes the importance of locally-led development and the importance of engaging stakeholders at all levels, including farmers, local communities, governments, and the private sector. It acknowledges the need for investment in research and innovation, as well as in building the capacity of local institutions to support sustainable agricultural development and food security. By prioritizing evidence-based approaches and sustainable development, the GFSS aims to support

⁸ U.S. Government Global Food Security Strategy: FY 2022-2026, 2022. USAID.
https://www.usaid.gov/sites/default/files/2022-05/Global-Food-Security-Strategy-FY22-26_508C.pdf

⁹ Ibid

the development of resilient and inclusive food systems that provide healthy and nutritious food for all.

1.5 Global Food Security Research Strategy

Developed by USAID, the Global Food Security Research Strategy (GFSRS) is a framework to guide its research efforts to address global food security challenges. Launched in 2016 and updated in 2022, the GFSRS provides a framework for addressing research gaps and generating research outputs to support sustainable agriculture, food security, and nutrition.¹⁰

The GFSRS contains three key research priorities, which include:

- 1) Climate-smart agriculture (CSA) innovations
- 2) Nutrition and food systems
- 3) Genetic improvement of crops and livestock¹¹

To address these research priorities, the GFSRS recommends a collaborative and multidisciplinary approach to research involving partnerships with researchers, institutions, and organizations in the public and private sectors. Notably, the strategy acknowledges the importance of integrating social, economic, and environmental considerations into research to ensure that research efforts are relevant and responsive to the needs and priorities of local communities.

¹⁰ U.S. Government Global Food Security Research Strategy: FY 2022-2027. USAID. <https://cg-281711fb-71ea-422c-b02c-ef79f539e9d2.s3.us-gov-west-1.amazonaws.com/uploads/2022/10/U.S.-Government-Global-Food-Security-Research-Strategy-508c.pdf>

¹¹ Ibid

The GFSRS recognizes that research alone is insufficient to address global food security challenges and emphasizes the need to translate research into effective policies, programs, and interventions. The strategy also highlights the importance of knowledge sharing, capacity building, and partnerships to ensure that research findings are effectively communicated and applied.

1.6 USAID Programming Pathway: Centrally-Funded Mechanisms

USAID Washington centrally manages and funds a range of procurement and grant mechanisms, which they use to facilitate the award of contracts and grants and streamline the procurement process for programs and projects internationally. Central mechanisms enable USAID to leverage expertise, resources, and established frameworks to address specific development challenges more effectively across all contexts in which programs are implemented.

1.6.2 USAID Bureau for Resilience and Food Security Research Portfolio

Through Feed the Future funding, USAID's Bureau for Resilience and Food Security (RFS) administers a robust research portfolio encompassing crop improvement, production systems, nutrition, policy, and resilience. The RFS research portfolio directly contributes to the Global Food Security Strategy and aligns with Global Food Security Research Strategy.

1.6.2.1 Background of Collaborative Research Support Programs and Innovation Labs

Historically, the U.S. government's approach to promoting global food security has emphasized agricultural research as a critical driver for sustainable solutions to address hunger, malnutrition, and poverty globally. USAID established the Collaborative Research Support Programs (CRSPs) in the late 1970s as part of the U.S. government's efforts to promote agricultural development and food security in low and middle-income countries.¹² Designed to facilitate research collaborations between U.S. universities and their counterparts in developing countries, the CRSPs focused on addressing the specific agricultural challenges target countries faced. Additionally, CRSPs were designed to leverage scientific capability from U.S. land grant universities and facilitate collaboration with scientists in developing partner countries to help farmers increase their incomes and sustainably promote food security without depleting natural resources.¹³

Replacing the CRSPs, the Feed the Future Innovation Labs (FTFILs) were implemented in the early 2010s to build on the successes and lessons learned from CRSPs and address their shortcomings. Led by U.S. universities, Innovation Labs are critical for advancing novel solutions that support USAID's goals to reduce hunger, poverty, and malnutrition globally. As of 2023, 20 Innovations Labs are administered by 13 lead U.S. universities, which work in collaboration with over 70 U.S. colleges and

¹² CRSP Council, 1993. CRSP Contributions to Science and Technology for Development https://pdf.usaid.gov/pdf_docs/Pnadr839.pdf

¹³ Ibid

universities. The Innovation Labs emphasize the importance of partnerships between U.S. universities, host country research institutions, and local stakeholders in developing countries, focusing on cultivating long-term, sustainable impact.

1.6.3 USAID Mission Portfolios

USAID Mission portfolios are a collection of programs, projects, and activities designed to address specific development challenges in the countries where they operate. The portfolios are strategically planned, solicited, and managed by USAID Missions to ensure that U.S. government resources are effectively utilized to achieve the desired development outcomes. USAID Mission portfolios are typically organized around several key sectors and objectives, depending on the needs, priorities, goals, and U.S. foreign policy interests.

1.7 Partnering for Impact

Over the last decade, Feed the Future has supported more than 23 million people to rise out of poverty by increasing agriculture-led economic growth, resilience, and nutrition.¹⁴ Innovation is critical to achieving these objectives because it can increase efficiency and productivity; however, broad impact can only be achieved when new approaches and technologies are adopted and deliver benefits at scale. To accomplish this objective, the USAID must take a coordinated approach to enhance collaboration between the USAID centrally-funded Feed the Future Innovation Labs (FTFILs) and

¹⁴ Feed the Future, 2022. Building a Stronger Tomorrow: 2022 Feed the Future Progress Snapshot. <https://cg-281711fb-71ea-422c-b02c-ef79f539e9d2.s3.us-gov-west-1.amazonaws.com/uploads/2022/10/2022-FTF-Progress-Snapshot-Report-508c.pdf>

the USAID Missions in the field to drive scaling and adoption of context-specific solutions.

Currently, USAID does not have an effective system to catalyze collaboration between Feed the Future Innovation Labs and USAID Missions, resulting in missed opportunities for innovation uptake, scaling, and impact of Feed the Future-funded research in USAID's Zone of Influence (ZOI). Through a case-study approach, the following report reviews and analyzes two instances when USAID Missions and FTFILs coordinated to achieve impact and will detail potential pathways for other Innovation Labs and Missions to build on lessons learned and collaborate for the commercialization of innovations and scaling.

Part 2: Case Studies

2. USAID Mission to Malawi's Collaboration with the Feed the Future Innovation Lab for Peanut Research

2.1 Context: Malawi's Tobacco Industry

For over a century, the tobacco industry has played a prominent role in the economy of Malawi, which is often considered one of the most tobacco-reliant economies in the world.¹⁵ Colonial powers introduced tobacco in the late 19th century and it quickly

¹⁵ Prowse, M. (2013). A history of tobacco production and marketing in Malawi, 1890–2010. *Journal of Eastern African Studies*, 7(4), 691–712. <https://doi.org/10.1080/17531055.2013.805077>

became an important cash crop for Malawi by the early 20th century.¹⁶ During this time, the British established large tobacco plantations and strongly encouraged Malawian farmers to grow tobacco. Even after Malawi gained independence in 1964, the government continued broadly promoting tobacco production.

In the 1990s, the reform of burley tobacco production and marketing was the first major attempt to change the colonial structure of Malawi's economy.¹⁷ The Malawian government implemented a series of structural adjustment programs that were supported by the World Bank and USAID.¹⁸ A key component of these programs was the economic liberalization and privatization of state-owned enterprises, which included the tobacco industry. This reformation led to the tobacco industry in Malawi becoming dominated by a handful of large multinational corporations. These companies controlled the production, processing, and export of tobacco. Their operations had significant impacts on the country's economy, with tobacco comprising 60 percent of Malawi's agricultural exports, 13 percent of its GDP, and 23 percent of its total tax base in the early 2000s before the industry's decline.¹⁹

Recently, the Malawian government has faced increased pressure to diversify the economy away from tobacco production and promote alternative crops and

¹⁶ Ibid

¹⁷ Harrigan, J., 2001. *From Dictatorship to Democracy: Economic Policy in Malawi, 1964-2000*. Aldershot: Ashgate.

¹⁸ Prowse, M. (2013). A history of tobacco production and marketing in Malawi, 1890–2010. *Journal of Eastern African Studies*, 7(4), 691–712. <https://doi.org/10.1080/17531055.2013.805077>

¹⁹ Jaffee, S., 2003. *Malawi's tobacco sector: standing on one strong leg is better than on none* (English). Africa Region Working Paper Series; No. 55 Washington, D.C.: World Bank Group. <http://documents.worldbank.org/curated/en/505031468757241265>

industries.²⁰ As smoking declines globally, there is less demand for tobacco, which has been Malawi's primary foreign exchange source and the major cash crop for smallholder farmers for decades. The ability to diversify and identify new economic opportunities has become a priority for both farmers and tobacco companies.²¹

2.2 Project Justification

Over the past decade, Malawi's agricultural sector has experienced rapid growth catalyzed by smallholder farmers. This growth can largely be attributed to the Farm Input Subsidy Program (FISP) implemented by the Government of Malawi, which provides subsidized agricultural inputs to almost half of smallholder farmers.²² Despite this economic growth, rural poverty and nutritional outcomes have not improved as much as anticipated.²³ According to a 2014 study, rural poverty has somewhat decreased, but extreme rural poverty has increased.²⁴ Moreover, most households in Malawi now spend more on food than before this period of growth. The FISP and other government policies have encouraged the production of maize, considered the primary staple crop, at the expense of agricultural diversity. This has resulted in smallholder

²⁰ Davies, P., 2003. Malawi: Addicted to the leaf. *Tobacco Control*, 12(1), 91–93. <https://doi.org/10.1136/tc.12.1.91>

²¹ Palladium, 2018. Malawi Ag Diversification Annual Report FY 2018. pdf.usaid.gov/pdf_docs/PA00XSG7.pdf

²² Pauw, K., Beck, U., and Mussa, R. (2016). Did rapid smallholder-led agricultural growth fail to reduce rural poverty? making sense of Malawi's poverty puzzle. *Growth and Poverty in Sub-Saharan Africa*, 89–111. <https://doi.org/10.1093/acprof:oso/9780198744795.003.0005>

²³ IFPRI, 2015. *Mapping the Linkages Between Agriculture, Food Security, and Nutrition in Malawi*. Washington, D.C. IFPRI.

²⁴ Pauw, K., Beck, U., and Mussa, R. (2016). Did rapid smallholder-led agricultural growth fail to reduce rural poverty? making sense of Malawi's poverty puzzle. *Growth and Poverty in Sub-Saharan Africa*, 89–111. <https://doi.org/10.1093/acprof:oso/9780198744795.003.0005>

farming systems and diets becoming increasingly dominated by maize, which accounts for about 80 percent of land cultivated by smallholder farmers.²⁵

The absence of progress in the nutritional outcomes of rural Malawians can be attributed to several factors, including persistent rural poverty and the rising percentage of total household expenses dedicated to food. Additionally, the dietary variety of rural households tends to mirror their agricultural diversity, and their maize-centric farming system has not demonstrated success in alleviating poverty or addressing the chronic lack of essential dietary nutrients.²⁶

The International Food Policy Research Institute's (IFPRI) research in Malawi validates three impact pathways through which agriculture can enhance nutrition. IFPRI's 2015 analysis demonstrates a strong connection between crop diversification in Malawi and increased dietary diversity and micronutrient access in households. This finding supports the first impact pathway, which posits that farm families consume their own diverse and nutritious produce, leading to the potential for better nutrition outcomes. This expands on Snapp and Fisher's work in 2014, which reached similar conclusions but emphasized that households typically diversify into nutrient-rich crop production and consumption only after satisfying their maize needs or having "filled their maize basket."²⁷

²⁵ Stevens, T., Madani, K. 2016. Future climate impacts on maize farming and food security in Malawi. *Sci Rep* 6, 36241. <https://doi.org/10.1038/srep36241>

²⁶ IFPRI, 2015. *Mapping the Linkages Between Agriculture, Food Security, and Nutrition in Malawi*. Washington, D.C. IFPRI.

²⁷ Snapp, S. S., & M. Fisher. 2014. "Filling the Maize Basket' Supports Crop Diversity and Quality of Household Diet in Malawi." *Food Security*: 7, 83-96.

Evidence indicates that farm households with a market orientation tend to exhibit greater dietary diversity, corroborating the second impact pathway in which agricultural income leads to improved nutritional outcomes.²⁸ Snapp and Fisher also discovered that income, especially when controlled by women, played a critical role in enhancing dietary diversity in Malawi. This evidence also validates the third impact pathway, which highlights the importance of women's empowerment and their decision-making power over income for better nutrition.²⁹

It is evident that the relationship between agriculture and nutrition in Malawian farm households is not straightforward; instead, it involves a complex decision-making process. Increased dietary diversity often arises from a combination of diverse crop production and higher income, particularly when women manage the income, underscoring the importance of augmenting diverse agricultural production for home consumption and market participation.

Leveraging the research and evidence outlined above, the USAID Mission to Malawi designed the Feed the Future Malawi Ag Diversification Activity to align with the three impact pathways.

²⁸ International Food and Policy Research Institute, 2015. Mapping the Linkages Between Agriculture, Food Security, and Nutrition in Malawi. Washington, D.C. IFPRI.

²⁹ Ibid

2.3 Malawi Mission Solicitation for the Feed the Future Malawi Ag Diversification Activity

On April 8, 2016, the USAID Mission to Malawi released Request for Proposal (RFP) No. SOL-612-16-000008, soliciting proposals for the implementation of the Feed the Future Malawi Ag Diversification Activity.³⁰ Notably, Section C – Description/Statement of Objectives of the solicitation outlines the Malawi Mission’s commitment to leveraging research funded through Feed the Future Innovations Labs, and other USAID Implementing Partners (IPs).

The following text appeared in the solicitation to encourage and/or require collaboration between the future Mission Implementing Partner and Feed the Future Innovation Labs:

“The Contractor must collaborate with USAID implementing partners within the agriculture sector,” and specifies that the collaboration must be two-fold through, “1) Integration with other DO [Development Objective] 2 activities supporting climate change, nutrition, and food security efforts and 2) Integration with activities from other DOs including health, education, and governance.”³¹

“Led by U.S. universities and funded by USAID/Washington, the Feed the Future Innovation Labs are central to advancing novel solutions to reducing global hunger, poverty, and undernutrition. The seven Innovation Labs listed below are currently operational in Malawi and have technologies and knowledge that Ag Diversification could benefit enormously from accessing and disseminating. The Contractor must therefore collaborate with the Innovation Labs to ensure that their research in Malawi informs a strong science and technology base for this activity.”³²

³⁰ USAID, 2016. Request for Proposal (RFP) No. SOL-612-16-000008 Feed the Future Malawi Ag Diversification. <https://sam.gov/opp/99b3a71223b352245f7f92a0c5ea7d49/view>

³¹ Ibid

³² Ibid

*“USAID/Malawi is committed to advancing the application of STIP to solve development problems. STIP [Science, Technology, Innovation, and Partnerships] approaches hold significant potential to increase the cost-effectiveness, impact, and sustainability of development assistance efforts in Malawi. The Contractor must therefore apply STIP approaches across all outcomes, and exercise flexibility to apply STIP throughout the life of the activity. As a central part of its STIP strategy, the Contractor must engage with the Feed the Future Innovation Labs, which are conducting state-of-the-art agricultural research and field activities in Malawi, to scale up the most promising technologies and innovations.”*³³

This direct language helped lay the foundation for the future collaboration between the Mission-funded AgDiv activity and the USAID Washington centrally funded Feed the Future Innovation Lab for Peanut Research, along with other USAID-funded Implementing Partners.

2.5 Malawi Ag Diversification Activity Awarded

The five-year Feed the Future Malawi Ag Diversification Activity was awarded to Palladium on September 28, 2016. Initially, the award was anticipated to continue until September 29, 2021, but was extended by the Malawi Mission until September 2022.

2.6 AgDiv Collaboration with the Feed the Future Peanut Innovation Lab

Since AgDiv’s inception, the activity has actively partnered and contracted with the Feed the Future Peanut Mycotoxin Innovation Lab (PMIL). The cooperative agreement was recompeted and renamed in 2018 as the Feed the Future Peanut Research Innovation Lab (PRIL). This report will refer to both iterations of the research activity as the Peanut Innovation Lab (PIL).

³³ Ibid

2.6.2 Feed the Future Innovation Lab for Peanut Overview

The Feed the Future Innovation Lab for Peanut Research (PRIL), previously known as the Peanut & Mycotoxin Innovation Lab (PMIL) and the Peanut Collaborative Research Support Program (Peanut CRSP), was first established in 1982 and has historically been managed by the University of Georgia (UGA).³⁴ For decades, the program has facilitated collaboration between U.S. scientists and research institutions in developing nations, aiming to improve peanut production and benefit peanut farmers and consumers worldwide. The Peanut Innovation Lab carries on the tradition of the U.S. peanut research community and industry supporting peanut farmers in developing nations to improve their food security. Currently, PIL focuses on combating hunger by supporting smallholder farmers in cultivating and benefiting from nutritious peanut crops. This involves various activities such as creating new peanut varieties, implementing effective pre- and post-harvest management techniques, carrying out research on peanut-based nutrition, and addressing gender and youth issues in peanut farming.³⁵

2.6.1 Key Collaboration Areas between AgDiv and the Peanut Innovation Lab

Year 1

AgDiv initiated a cost-benefit analysis (CBA) to guide their strategic priorities and support evidence-based interventions to improve the livelihoods of smallholder

³⁴ Innovation Lab for Peanut. (n.d.). Past Research Projects. Retrieved April 5, 2023, from <https://ftfpeanutlab.caes.uga.edu/PreviousResearch.html>

³⁵ Ibid

farmers. The CBA was co-led by PIL, the University of Connecticut, and the Feed the Future Soybean Innovation Lab.³⁶ The CBA focused on:

- Assessing the production of new groundnut varieties, along with aflatoxin mitigation measures.
- Comparing inoculant-enhanced soybean production to conventional growing practices.
- Comparing production utilizing drip irrigation for groundnuts and soybeans with conventional production methods, regarding field and seed multiplication.

The CBA was utilized by AgDiv to enable a periodic review and update of the Collaborate Learn Adapt (CLA) plan to ensure AgDiv continuously identified and disseminated innovations that met the target beneficiary's needs.³⁷

Year 2

In Year 2, AgDiv focused on expanding access to certified, high-quality groundnut seed to complement the promotion of productivity-and quality-enhancing technologies. As a result, in 2017 AgDiv began collaborating and contracting with PIL to support groundnut variety seed trials.³⁸

Partnership Components:

- AgDiv and PIL, working together with the Malawi Department of Agricultural Research Services (DARS), Exagris Africa Ltd, Horizon Farming Ltd, and other agribusinesses, embarked on groundnut variety experiments to pinpoint the

³⁶ Palladium, 2017. Malawi Ag Diversification Annual Report FY 2016-2017. https://pdf.usaid.gov/pdf_docs/PA00XRTF.pdf

³⁷ Ibid

³⁸ Ibid

best elements for affordable, lucrative, high-output, and eco-friendly peanut cultivation solutions.

- During the 2017-2018 rainy season, the trials concentrated on different varieties, using inoculants during planting, calcium application, and timely harvesting.
- During the 2018 winter dry season, drip irrigation was examined, emphasizing variety selection and the optimal spacing between seeds and the drip line.³⁹

Additionally, at the invitation of the PIL and the University of Georgia, AgDiv guided a group of 10 key personnel from Malawi's seed production sector on a visit to the Georgia Seed Foundation for the yearly Georgia Peanut Tour in the United States in September 2018. This 4-day excursion introduced the attendees to best practices ranging from agronomy to manufacturing and food safety. As a result, private sector cultivators in Malawi are now incorporating the insights gained on seed production and post-harvest management into their strategies for expanding Malawi's groundnut industry.⁴⁰

Year 3

AgDiv catalyzed the collaboration between PIL researchers, the private sector, and the Malawian government on the groundnut variety trials and seed production projects previously initiated in Year 2.⁴¹

³⁹ Palladium, 2018. Malawi Ag Diversification Annual Report FY 2018. https://pdf.usaid.gov/pdf_docs/PA00XSG7.pdf

⁴⁰ Ibid

⁴¹ Palladium, 2019. Malawi Ag Diversification Annual Report FY 2019. https://pdf.usaid.gov/pdf_docs/PA00XRTK.pdf

- AgDiv brokered deals with private sector actors to make investments in new value chains with technical support from PIL. This resulted in Pyxus, a private sector tobacco company, investing in groundnut buying points and Limbe Leaf Tobacco Company Limited's (LLTC) investing in groundnut seed production.⁴²
- PIL, in collaboration with the Malawi DARS, Pyxus, LLTC, and other private sector companies, designed a high-tech seed production package based on U.S. standards. This partnership resulted in the production of high-quality basic seed, which allows LLTC and other commercial farming companies the opportunity to produce large-scale certified seed under intensive agronomic management to provide high-quality certified seed to their contract growers.⁴³
- Malawi DARS received technical assistance and capacity strengthening on peanut agronomy and disease management through PIL.⁴⁴

Year 4

AgDiv continued facilitating collaboration between PIL researchers, private sector companies, and the Malawi DARS on initiatives around groundnut variety trials and seed production projects, agronomy trials, and aflatoxin research. Technical support provided by PIL influenced private sector actors to invest in new peanut value chains.

- Partnerships fast-tracked the rate of introducing new genetic materials to the groundnut market in Malawi.
- Three new peanut varieties were released in Year 4 by the Malawi DARS, cutting the time to develop and test new varieties before release by about 60

⁴² Ibid

⁴³ Ibid

⁴⁴ Ibid

percent.⁴⁵ PIL, in partnership with the Malawi DARS, sourced groundnut genetic material from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Zambia Agriculture Research Institute (ZARI). Varietal testing occurred over several seasons, identifying the most resilient and highest-yielding varieties that hold potential in the commercial market.⁴⁶

- Due to the partnership brokered by AgDiv, Pyxus expressed interest in establishing its own Memorandum of Understanding (MOU) with PIL to continue varietal trials after AgDiv's award completion.⁴⁷

Year 5

AgDiv continued conducting varietal and agronomic trials in collaboration with PIL, the Malawi DARS, and private sector companies.

- In 2021 the new “Guide to Groundnut Production in Malawi,” created through a collaboration between PIL and the Malawi DARS, incorporated information from trials conducted in the private sector. The guide features the latest and most effective groundnut growing recommendations applicable to the Malawi context, and the intention to improve and regularly update it.⁴⁸

⁴⁵ Palladium, 2020. Malawi Ag Diversification Annual Report FY 2020. https://pdf.usaid.gov/pdf_docs/PA00XRTM.pdf

⁴⁶ University of Georgia, 2020. Peanut Innovation Lab Annual Report FY 2020. <https://ftfpeanutlab.caes.uga.edu/content/dam/caes-subsite/ftf-peanut-lab/documents/peanut-lab/Peanut%20IL%20Annual%20Report%20FY2020-20201208.pdf>

⁴⁷ Palladium, 2022. Malawi AgDiv Midterm Evaluation Report 2022. https://pdf.usaid.gov/pdf_docs/fPA00X27W.pdf

⁴⁸ Palladium, 2021. Malawi Ag Diversification Annual Report FY 2021. https://pdf.usaid.gov/pdf_docs/PA00XRTM.pdf

- Initiated projects to evaluate the use of Aflasafe, an IITA-developed aflatoxin biocontrol technology, to improve grading and aflatoxin testing capacity.⁴⁹
- In partnership with Lilongwe University of Agricultural and Natural Resources (LUANAR), research and strategic recipe development was initiated for inclusion of peanuts in a pre-existing soymilk project to promote increased groundnut consumption.⁵⁰

2.6.2 Impact of AgDiv and Peanut Innovation Lab Partnership

Supported by AgDiv and private sector companies, PIL worked with the Malawi DARS, to validate improved groundnut practices, developed a range of training tools and production guides, and supported their dissemination through a network of local agronomists. Since its launch in 2018, 83 percent of the 114,000 peanut farmers supported by AgDiv now apply improved technologies and practices, a dramatic increase from only 5 percent at the outset.⁵¹ This yielded dividends for producers, with net farmer income during this activity period increasing 137 percent, despite considerable disruption to market systems during the Covid-19 pandemic.⁵² During this time, PIL supported the testing and validation of three improved peanut varieties through the Pan African Trials. In 2020, the Malawi DARS released the three new varieties, providing Malawi groundnut farmers access to more resilient and productive varieties adapted for the local conditions.

⁴⁹ University of Georgia, 2021. Peanut Innovation Lab Annual Report FY 2021. <https://ftfpeanutlab.caes.uga.edu/content/dam/caes-subsite/ftf-peanut-lab/documents/peanut-lab/FY%202021%20Peanut%20IL%20Annual%20Report-FINAL.pdf>

⁵⁰ Ibid

⁵¹ Palladium, 2021. Malawi Ag Diversification MEL Annual Survey Report FY 2021. https://pdf.usaid.gov/pdf_docs/PA00Z68K.pdf

⁵² Ibid

3. USAID Mission to Guatemala's Associate Award to the Feed the Future Innovation Lab for Collaborative Research on Grain Legumes

3.1 Context: Guatemala's Western Highlands History

Guatemala's Western Highlands have historically been home to numerous indigenous Mayan ethnic groups. The Mayan people developed advanced agricultural techniques, primarily focusing on the cultivation of maize, beans, and squash. Research suggests that these "three sisters" of agriculture have been the foundation of Mayan diets for over 3,500 years.⁵³

In the 16th century, the Spanish arrived in Guatemala and subjugated the Mayan population using the *encomienda* system.⁵⁴ This system forced indigenous communities into labor for the Spanish colonizers, causing significant social and economic upheaval. The colonial system directly contributed to the dispossession of lands and resources by the Mayan people, laying the foundation for the deep-rooted inequality and poverty that persist to this day.⁵⁵

Currently, the Western Highlands remain predominantly inhabited by indigenous communities, but access to quality farmland remains a significant issue. Even after the end of Spanish colonization, the fertile land has remained primarily owned by a handful

⁵³ Landon, Amanda J., "The "How" of the Three Sisters: The Origins of Agriculture in Mesoamerica and the Human Niche" (2008). *Nebraska Anthropologist*. 40. <https://digitalcommons.unl.edu/nebanthro/40>

⁵⁴ Castro, J., & Picq, M. L. (2017). *Stateness as Landgrab: A political history of Maya dispossession in Guatemala*. *American Quarterly*, 69(4), 791–799. <https://doi.org/10.1353/aq.2017.0065>

⁵⁵ *Ibid*

of powerful elites.⁵⁶ Forced to cultivate less productive lands, many indigenous farmers experience low agricultural yields and food insecurity. Inadequate access to agricultural inputs, improved technologies, and finance have also limited the ability of indigenous smallholder farmers to improve productivity. Deforestation, soil erosion, and climate change further exacerbate agricultural constraints.

Poor nutrition outcomes are also a major challenge in the Western Highlands, with many children suffering from chronic malnutrition and micronutrient deficiencies.⁵⁷ Even though indigenous communities have historically grown nutritious crops like maize, beans, and squash, many families still struggle to eat a diverse diet of healthy foods. Adverse effects are compounded by the lack of education and awareness surrounding balanced nutrition, particularly regarding its impact on children's growth and development.⁵⁸

3.2 Project Justification

The indigenous Mayan community in Guatemala's Western Highlands remains one of the most undernourished populations in the world.⁵⁹ The Mayan population's dietary intake predominantly consists of maize, providing inadequate nutrients for optimal metabolic function. This diet results in increased levels of chronic malnutrition in

⁵⁶ Lovell, W. G. (1983). Landholding in Spanish central America: Patterns of ownership and activity in the Cuchumatán Highlands of Guatemala, 1563-1821. *Transactions of the Institute of British Geographers*, 8(2), 214. <https://doi.org/10.2307/622111>

⁵⁷ FHI 360, 2013. Summary Report: Development of Evidence-Based Dietary Recommendations for Children, Pregnant Women, and Lactating Women Living in the Western Highlands of Guatemala. <https://www.fantaproject.org/sites/default/files/resources/Guatemala-Optifood-Summary-Oct2013.pdf>

⁵⁸ Ibid

⁵⁹ UNICEF, 2013. An offensive against malnutrition in Guatemala. Thomas Nybo, UNICEF Correspondent's report. http://www.unicef.org/infobycountry/guatemala_68725.html

children, which can lead to poor cognition, reduced educational performance, and affect productivity and wage-earning potential throughout their adult life.

Evidence-based research regarding dietary interventions for addressing chronic malnutrition in the Western Highlands of Guatemala has emphasized the significance of beans as a top nutrient source.⁶⁰ The USAID-funded Food and Nutrition Technical Assistance III (FANTA III) project found that in most instances malnutrition in the region could be effectively managed through the consumption of a combination of beans, leafy green vegetables, and animal-sourced foods.⁶¹ Additional research revealed that increased bean yields significantly improved household energy consumption from self-produced beans, which correlates to improved nutrition outcomes.⁶²

Unfortunately, most smallholder farmers have restricted access to technologies that enhance bean productivity and domestic consumption of beans remains limited. Additionally, beans are scarce and expensive in the Western Highlands due to limited access to farmland and low bean productivity since many bean varieties perform poorly at elevations above 2,500 meters.⁶³ Furthermore, evidence showed that even when beans were available, they were not always consumed due to a lack of awareness of their nutritional value.

⁶⁰ FHI 360, 2013. Summary Report: Development of Evidence-Based Dietary Recommendations for Children, Pregnant Women, and Lactating Women Living in the Western Highlands of Guatemala. <https://www.fantaproject.org/sites/default/files/resources/Guatemala-Optifood-Summary-Oct2013.pdf>

⁶¹ Ibid

⁶² Immink MDC. Nutrition, Poverty Alleviation, and Development in Central America and Panama. *Food and Nutrition Bulletin*. 2010;31(1):161-172. doi:10.1177/156482651003100116

⁶³ Masfrijol. Feed the Future Legumes Innovation Lab. (n.d.). Retrieved March 5, 2023, from https://www.canr.msu.edu/legumelab/uploads/files/MASFRIJOL_FTF_English_Final_complete.pdf

In the early 2010s, the Government of Guatemala and donor-led initiatives documented and reported on the consequences of malnutrition in the highlands area, which is particularly prevalent among the children of Mayan families. Government-funded hunger and malnutrition relief projects worked in a state of emergency to improve nutrition outcomes in priority municipalities, mainly those with the highest stunting rates. The USAID Mission to Guatemala's Feed the Future Western Highlands Initiative Program (WHIP) launched multiple programs in close collaboration with local NGOs, building on and leveraging their strong local knowledge of the target population. As a result of these relationships, the USAID Mission proposed a new project as a component of WHIP, that would focus holistically on improving family-level nutrition outcomes through increased bean consumption.

3.3 Guatemala Mission Solicitation

On January 24, 2014, a Request for Associate Award Application (RFAA) was sent to the Director of the Innovation Lab for Collaborative Research on Grain Legumes (Legumes IL), AID-EDH-A-00-07-00005, by the Agreement Officer Representative (AOR) at the instruction of the USAID Mission to Guatemala.⁶⁴ The Legume IL was centrally funded by USAID Washington's Bureau of Food Security (BFS), Office of Agricultural Research and Policy, and administered by Michigan State University (MSU). The Mission recognized that the Legumes IL had spearheaded a robust range of research initiatives, resulting in substantial improvements in bean productivity and

⁶⁴ USAID, 2014. Request for Associate Award Application. 24 January 2014.

seed system development in collaboration with partners in Africa and Central America. The Guatemala Mission intended to grant an Associate Award (AA) under the centrally funded Leader Award for the Legumes IL to support the further expansion, promotion, and production of improved bean technologies for better nutrition as a component of WHIP.

The USAID Mission to Guatemala sought to enhance nutrition in Guatemala's Western Highlands by increasing bean consumption through two main pathways. Firstly, the proposed project would enhance bean system productivity in the Western Highlands by introducing and disseminating new high-yield bean varieties. Secondly, the project would encourage greater bean consumption through extension and nutrition education programs.

3.4 Feed the Future Legume Systems Innovation Lab Overview

The Feed the Future Innovation Lab for Legumes Systems (Legumes IL), previously known as the Innovation Lab for Collaborative Research on Grain Legumes, Pulse Collaborative Research Support Program (Pulse CRSP), and Bean/Cowpea Collaboration Research Support Program (Bean/Cowpea CRSP), was established in the early 1980s and has historically been managed by Michigan State University (MSU). Currently, the Legumes IL focuses on improving legume (cowpea, pigeon pea, common bean) systems to take advantage of legumes nitrogen-fixing capacity, which improves soil fertility, capability to serve as livestock feed and fodder, income-

generating potential for smallholder farmers, and nutritious qualities that benefit human health and contribute to increased food security.⁶⁵

3.5 Legume Systems Innovation Lab MásFrijol Project Proposal Overview

In March 2014, the Legumes IL proposed the MásFrijol project as a four-year Associate Award to the Leader Award. MásFrijol, meaning “more beans,” was designed to mobilize the expertise and experience of the Legume IL and its network of partners to strengthen the USAID Mission to Guatemala’s efforts to achieve its strategic development goals for the country under Feed the Future.⁶⁶

The project proposed to promote greater consumption of beans, enhance the nutritional value of diets, and improve food and nutritional security in Mayan Western Highland communities, through interventions that improved the productivity of the bean-maize system and increased awareness of the nutritional value of beans.

MásFrijol was to serve as an innovative approach that combined agricultural and nutritional interventions to reach households at their doorsteps, utilizing 4-wheel drive vehicles to reach remote areas, and community-based public technicians to provide contextually relevant extension and nutrition education.⁶⁷ Over a four-year period, MásFrijol sought to implement a range of short-term and mid-term activities, customized to meet the unique needs of the culturally diverse and geographically

⁶⁵ Feed the Future Innovation Lab for Legume Systems Research. (n.d.). About Us. Retrieved April 7, 2023, from https://www.canr.msu.edu/legumelab/about_us/

⁶⁶ Michigan State University, 2014. Project Justification. <https://www.canr.msu.edu/legumelab/archived-programs/masfrijol/index>

⁶⁷ Ibid

isolated target community. The MásFrijol proposal suggested deploying a nutrition-sensitive technical approach, which involved conducting a participatory needs assessment, promoting validated technologies, integrated management practices, and educational activities from the Legume Innovation Lab, along with its partners, to maximize scalable impact among the targeted Mayan municipalities.⁶⁸

MásFrijol Project Objectives:

- 1) Substantially increase bean productivity by resource-poor smallholder farmers in Guatemala's Western Highlands
- 2) Significantly improve the nutritional quality of household diets through increased consumption of beans, along with the consumption of complementary nutritious vegetables and animal-derived foods.

3.6 MásFrijol Project Awarded

The forty-five-month Associate Award for the MásFrijol project was issued to the Feed the Future Collaborative Research on Grain Legumes on March 26, 2014.

3.7 MásFrijol Project Components

From 2013 to 2017, the MásFrijol project partnered with the Institute for Agricultural Science and Technology (ICTA), the Ministry of Public Health and Social Assistance, and other organizations to provide training regarding improved agricultural practices and nutrition to 25,000 Guatemalan households across 200 communities.⁶⁹ Although

⁶⁸ Ibid

⁶⁹ Center for Strategic and International Studies, 2017. Feed the Future in Guatemala. <https://www.jstor.org/stable/pdf/resrep23169.7.pdf>

targeting the same households with both agricultural and nutrition interventions would have been advantageous, seven out of the thirty target municipalities were unsuitable for bean production due to climate, soil, or altitude conditions; therefore, in these areas, only the educational component was implemented.

The project sought to address low bean yields based on evidence that smallholder farmers had limited access to technologies that could enhance bean productivity and lacked adequate bean storage capacity.⁷⁰ Throughout the four-year project, MásFrijol worked to increase smallholder farmers' access to quality seeds of improved, disease-resistant bean varieties adapted to local conditions through sustainable community seed production. The project promoted four varieties of black beans that increased averaged yields by around 25 percent but could increase yields by as much as 300 percent under ideal agronomic conditions.⁷¹

The commercialization of bean seed in the private-sector seed markets in the Western Highlands proved unfeasible for several reasons. Firstly, the seeds were heavy, which made them expensive to transport, and their selling price did not justify the cost.⁷² Since farmers primarily produced beans for home consumption, they were less willing to invest in producing and selling seeds. Furthermore, since beans are self-pollinating, new plants are essentially clones of their parents, which results in similar yields year after year.⁷³ Therefore, there was no returning customer base, unlike for high-value

⁷⁰ Ibid

⁷¹ Ibid

⁷² Ibid

⁷³ Ibid

horticultural seeds with recessive genes. As a result, MásFrijol determined that implementing a public-sector seed replication system would benefit local farmers the most.

3.8 MásFrijol Results

The project successfully established 47 community seed depots, surpassing its initial targets.⁷⁴ Over 8,000 bags of improved seeds were distributed to nearly 33,000 households, which was significantly greater than the initial target.⁷⁵ Alongside seed distribution, the project provided training on integrated crop management and access to improved post-harvest storage technologies. Additionally, improved black bean varieties were cultivated on 352 hectares of land, resulting in an impressive average yield of 779 kg of beans per hectare.⁷⁶

Regarding nutrition, MásFrijol worked towards improving household knowledge of the benefits of regular bean consumption and taught alternative processing and cooking methods with a focus on preparing easily digestible foods for young children. This resulted in over 8,000 community members receiving nutrition training and guidance on healthy meal preparation. The project had plans to evaluate behavioral and consumption shifts associated with this exposure.

⁷⁴ Masfrijol. Feed the Future Legumes Innovation Lab. (n.d.). Retrieved March 5, 2023, from https://www.canr.msu.edu/legumelab/uploads/files/MASFRIJOL_FTF_English_Final_complete.pdf

⁷⁵ Center for Strategic and International Studies, 2017. Feed the Future in Guatemala. <https://www.jstor.org/stable/pdf/resrep23169.7.pdf>

⁷⁶ Ibid

Additional Achievements:

- Upwards of 5,300 women participated in nutrition education and training to encourage adding beans at least three times a week to their family's meals.
- During the last year of the award, nearly 4,100 pounds of improved seed were produced and commercialized in the target communities by CSDs.
- One hundred twenty technicians from the Guatemalan Ministries of Agriculture and Health were cross-trained in the Agriculture and Nutrition program developed by MásFrijol.

Part 3: Observations and Recommendations

The two case studies presented offer insights into how USAID Missions can partner with centrally funded Innovation Labs to achieve their development objectives.

Displayed in the case studies were two successful pathways to partnership. The first case study highlighted the collaboration between AgDiv Malawi and the Peanut Innovation Lab, showing how a Mission's Implementing Partners can leverage the technical expertise of an Innovation Lab to develop and deploy relevant innovations that meet the demands of the local market. The second case study displayed how the Guatemala Mission was able to capitalize on the knowledge and expertise of the Legumes Innovation Lab, using an Associate Award to design and implement an activity that met a clearly defined need in a target community.

Below is a list of recommendations drawn from the two case studies to catalyze collaboration and impact across the Feed the Future portfolio.

1) Encourage Missions to Leverage Innovation Lab Expertise through Associate Awards

In the MásFrijol case study, the Guatemala Mission effectively used the Associate Award mechanism to leverage Innovation Lab expertise to achieve impact in the Western Highlands. A Leader with Associate (LWA), the instrument under which most Innovation Lab awards are issued, involves the issuance of a Leader Award that covers a specified worldwide activity through a Cooperative Agreement and can be leveraged by Missions to utilize Innovation Lab expertise to create impact in their Zone of Influence. The Leader Award includes language that allows a Mission or other office to make one or more separate awards, known as Associate Awards, to the Leader Award recipient without using restricted eligibility.⁷⁷ The Associate Award must be within the terms and scope of the program description of the Leader Award and support a distinct local or regional activity and can be made without using fair opportunity procedures. This mechanism offers an efficient and effective pathway for meaningful partnerships between USAID Missions and Innovation Labs.

2) Require Mission Implementing Partners to Collaborate with Innovation Labs

⁷⁷ U.S. Agency for International Development. (2023, April 12). An implementing partner's guide to types of Assistance Instruments: India. Retrieved April 30, 2023, from <https://www.usaid.gov/india/document/implementing-partners-guide-types-assistance-instruments>

When designing new awards funded under Feed the Future, Missions should include language requiring Implementing Partners to collaborate with Innovation Labs whenever possible to advance Feed the Future-funded technologies and research. Incorporating clear language about collaboration expectations into all relevant Mission NOFOs, including Requests for Proposals (RFPs) and Requests for Applications (RFAs), like the text used in the Malawi Ag Diversification Notice of Funding Opportunity (NOFO). Boilerplate language requiring collaboration should be developed by Innovation Lab AORs and distributed to Missions for use in upcoming awards.

3) Strategic Outreach to Missions Regarding Innovation Lab Research

Missions may not always be aware of Innovation Labs operating within their geographic area or be privy to Innovation Lab research streams that could contribute to their portfolio's success. The Bureau for Resilience and Food Security (RFS) should make a concerted effort to update Missions on Innovation Lab activities on an annual basis and actively seek potential synergies. RFS should strategically engage with Missions based on their priorities, by reviewing Country Development Coordination Strategies (CDCS) and Global Food Security Strategy Country Plan, for targeted outreach and collaboration.

4.1 Additional Insights

While the Transfer of Technology (ToT) approach to agriculture research and extension has been supported by USAID in the past and could be used by Missions

to disseminate technologies developed by Innovation Labs, it has notable limitations. The ToT model typically utilizes a top-down approach in which researchers and experts develop technologies with limited input from farmers. This can often lead to a disconnect between farmers' actual needs and priorities and the technologies being promoted. Within this model, there is often a lack of consideration for the local context. Furthermore, farmers may be reluctant to adopt new technologies if they perceive they are irrelevant or do not fully understand the benefits. Sustainable adoption and scaling of technologies and practices can be limited without local ownership.

Additionally, the ToT approach tends to undervalue farmers' indigenous knowledge and expertise, which can result in the loss of valuable insights and missed opportunities to build on potential synergies between local and scientific knowledge. Indigenous communities often deeply understand their local ecosystems, developed through generations of observation and interaction with their environments. This knowledge contributes to the effective stewardship of natural resources and can offer valuable insights for sustainable resource management and the conservation of biodiversity. In an agricultural context, indigenous knowledge can include information about locally adapted crop varieties, traditional farming practices, and sustainable land management. This knowledge can help enhance food security, promote agrobiodiversity, and sustainably improve agricultural productivity. To minimize the threats posed by ToT approach, it is crucial to recognize and respect indigenous knowledge systems and promote the involvement of indigenous communities in both

the decision-making and technology development process. Incorporating indigenous knowledge into technology development and scaling initiatives can create a more balanced and sustainable approach, benefiting both indigenous communities and society as a whole.

Deploying a participatory and action research-based approach to agricultural R&D could benefit both Missions, the Innovation Labs, and the communities they intend to impact. Missions could leverage Innovation Labs through Associate Awards to undertake participatory and action-oriented research that uses indigenous knowledge to develop relevant innovations collaboratively. This would help ensure that innovations are locally-led and meet the demands of the local context. This approach would also benefit Innovation Labs, as their research outputs would be less likely to languish on the shelf since local demand would be established. Instead of attempting to scale potentially unsuitable technologies developed by Innovation Labs, Missions should focus on contracting with Innovation Lab researchers to utilize local farmer knowledge to spur innovation through a locally-led bottom-up approach.

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