FEED THE FUTURE

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

Performance Evaluation Report for Feed the Future Innovation Lab for Soybean Value Chain Research (Soybean Innovation Lab) (SIL)

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USAID

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Performance Evaluation Report for Feed the Future Innovation Lab for Soybean Value Chain Research (Soybean Innovation Lab) (SIL)

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Cover Photo: Participants at SIL's 3rd Annual Soybean Kick-off event visiting the SIL SMART Farm at the Savanna Agricultural Research Institute, near Tamale, Ghana. Photo Credit: Edward Sikora

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ABSTRACT

The Soybean Innovation Lab (SIL) is a 5-year, $10 million Research-for-Development (R4D) project, managed by the University of Illinois at Urbana-Champaign (2013-2018). SIL researches factors limiting adoption and sustainability of soybean production, processing, and consumption in sub-Saharan Africa. The research results are translated to key stakeholders, including development practitioners, the private sector, and government agencies. The evaluation of SIL focuses on program management; the research and training program; institutional collaboration; and the program's future. In visits to Urbana-Champaign, Ghana, and Ethiopia, the evaluation team collected qualitative and quantitative data through 1) program document review; 2) 59 key informant interviews; 3) group discussions with Principal Investigators; 4) direct observation of two key program-related events; 5) case studies of selected R4D products; and 6) an online survey of 35 SIL staff and partners. SIL's R4D products are largely appropriate, but dissemination should be part of the research process and guided by articulation of development pathways for R4D products. The evaluation found that SIL's wide range of partnerships has successfully developed institutional capacity, but more networking and linkage activities—by both SIL and USAID—are recommended. SIL's current investments in technical research areas should continue, with particular attention paid to practical ways research is undertaken to ensure technology uptake. Gaps in market linkages for input and output value chains need to be identified and addressed. In the future, extension support to development partners and feedback loops on the uptake and use of SIL's R4D products and associated outputs will also be needed.

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ACRONYMS

Acronym	Definition
AgDiv	Ag Diversification Project in Malawi
AGRA	Alliance for a Green Revolution in Africa
AOR	Agreement Officer's Representative
BFS	Bureau for Food Security
CGIAR	Consultative Group on International Agricultural Research
CLA	Collaborating, Learning, and Adapting
CRS	Catholic Relief Services
CSIR	Council for Scientific and Industrial Research (Ghana)
EIAR	Ethiopian Institute for Agricultural Research
EOI	Expression of Interest
EQ	Evaluation Question
ET	Evaluation Team
FB	Facebook
FGD	Focus Group Discussion
FTF	Feed the Future
GRADA	Gender Responsive Agricultural Development Assessment
HP	High Priority
HQ	Headquarters
HYV	High Yielding Variety
IBP	Integrated Breeding Platform
IIAM	Instituto de Investigação Agrária de Moçambique
IITA	International Institute for Tropical Agriculture
IR	Intermediate Result
JARC	Jimma Agricultural Research Center
KI	Key Informant
KII	Key Informant Interview
LOE	Level of Effort
M&E	Monitoring and Evaluation
MAS	Marker Assisted Selection
ME	Management Entity
ME&A	Mendez England & Associates
MEDA	Mennonite Economic Development Associates
MP	Medium Priority
MRA	Managed Research Areas
MSU	Mississippi State University
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
PEEL	Program Evaluation for Effectiveness and Learning
PI	Principal Investigator
R4D	Research for Development
SARI	Savanna Agricultural Research Institute (Ghana)
SFSA	Syngenta's Foundation for Sustainable Agriculture
SIL	Soybean Innovation Lab
SMART	Soybean Management with Appropriate Research and Technology
SO	Strategic Objective
SOW	Scope of Work
SSA	Sub-Saharan Africa
ToT	Training-of-Trainers

Acronym	Definition
UIUC	University of Illinois at Urbana-Champaign
UOM	University of Missouri
U.S.	United States
USAID	United States Agency for International Development
USDA-ARS	United States Department of Agriculture–Agricultural Research Service
WACCI	West Africa Center for Crop Improvement

EXECUTIVE SUMMARY

EVALUATION PURPOSE

This final performance evaluation of the Soybean Innovation Lab (SIL) provides robust evidence-based findings, conclusions, and recommendations to help guide the United States Agency for International Development (USAID) Bureau for Food Security (BFS) in decision-making on the future direction of the program in terms of strategies and investments. The evaluation focuses on three themes of the SIL Program—program management, research and training program, and institutional collaboration—and addresses specific evaluation questions (EQs) under each theme. In addition, it highlights features of the SIL Program and the program's approach that merit continuing and new investment in the future.

PROJECT BACKGROUND

The SIL Program was designed to perform research that addresses factors limiting the adoption and sustainability of soybean production, processing, and consumption in sub-Saharan Africa (SSA) as well as translating knowledge to key stakeholders, including development practitioners, the private sector, and government agencies. SIL's overall approach is based on four "research-for-development" (R4D) pillars that comprise the essential components of sustained production, improved household nutrition, and sustainable market linkages for soybean farmers. The four pillars are:

1. Genetic Improvement through an Accelerated Seed Production System;
2. Enhanced Crop Productivity and Quality through Soybean Management with Appropriate Research and Technology (SMART) Farms;
3. Human Nutrition and Utilization;[1] and
4. Value Chains, Gender, and Socio-Economic Research.

The University of Illinois at Urbana-Champaign [defined as the Management Entity (ME)] leads SIL's implementation. Other lead partners include the University of Missouri (UOM), Mississippi State University (MSU), and the International Institute for Tropical Agriculture (IITA). SIL's research activities and projects in Africa are implemented by in-country partners, often national agricultural research centers and universities. Development partners include non-governmental organizations (NGOs), local organizations, government entities and institutions, USAID Mission contractors, and private sector firms. It is important to note that SIL's primary beneficiaries are not smallholder farmers but the partner research organizations and practitioners that aim to develop the soybean value chain. SIL's initial activities were centered in Ghana, Ethiopia, Malawi, Mozambique, and Zambia and have now expanded to 15 additional countries.[2]

The R4D approach adopted by SIL provides an essential context to the program, most notably in the ways that research is understood and conducted, and in the ways that SIL works with its partners. R4D is primarily concerned with how research can contribute towards longer-term development goals. The SIL Program undertakes activities with both research and development partners.[3]

[1] The original SIL proposal included a module on livestock nutrition, but this was cut at the request of the reviewers. The SIL Program is still interested in supporting livestock nutrition, particularly because 98 percent of soybean production in Africa is used in livestock feed, and there is high development potential for the poultry and aquaculture sectors.
[2] Colombia, Côte d'Ivoire, Haiti, Indonesia, Kenya, Liberia, Mali, Nicaragua, Nigeria, Pakistan, Rwanda, South Africa, Tanzania, Uganda, and Zimbabwe.
[3] In this document, "research partners" refers to the national and international agricultural research centers and the universities and academic institutions; "development partners" are the NGOs, government departments and authorities, and donor-funded projects. Private sector entities can be either research partners or development partners, depending on their function.

EVALUATION DESIGN, METHODS, AND LIMITATIONS

The evaluation of SIL adopted a mixed-method approach that included qualitative and quantitative data collection methods to address the key questions. Qualitative data were collected by: 1) a review of major program documents; 2) key informant interviews (KIIs) with the key stakeholders; 3) a group discussion with the Principal Investigators (PIs); 4) direct observation of two key program-related events; and 5) case studies of selected R4D products. Quantitative data were collected through an online survey implemented among SIL's partners across the various countries. Due to budget and time constraints, the team visited only two purposively selected countries (Ethiopia and Ghana) out of the five main countries where SIL is active. As such, the results are not generalizable to all SIL Program sites.

FINDINGS AND CONCLUSIONS

The table below summarizes the evaluation's findings and conclusions, which are based on the evaluation questions.

FINDINGS	CONCLUSIONS
EQ 1.1: To what extent has the ME effectively implemented and managed the SIL's respective research, training, and dissemination activities and how could this process be improved in future programs?	
Overall management by the ME was highly praised. The only challenge mentioned by KIIs was delayed disbursement of funds from USAID. Both research and training are designed and managed by Managed Research Areas (MRA) PIs, based on disciplinary strengths. The R4D products provide something very tangible that can be disseminated to development partners.	The ME is effective in implementing and managing SIL's research, training, and dissemination activities. Delayed disbursement of funds negatively impacts SIL's relationship with some partners. The management of research and training are both decentralized to the MRA PIs. Such decentralization risks creating a "silo-effect" unless efforts are made to share knowledge and integrate the research across the MRAs. There is the opportunity to focus dissemination activities around SIL's R4D products and for the Communications Director to work with PIs to identify and generate a range of communications outputs, targeting the different audiences associated with each product.
EQ 1.2: How effectively did the ME communicate and coordinate with USAID/BFS, USAID Missions, partners, host country government partners, local researchers, and other stakeholders as a way to: better achieve project goals and objectives; create and carry out a shared research agenda; improve the capacity of local researchers; and improve dissemination?	
The ME uses several means of communication, including face-to-face meetings, site visits, remote meetings, videos, monthly newsletters, semi-annual and annual reports, etc. Coordination is achieved through sub-award agreements and associated Scopes of Work, as well as annual work and travel plans. All interviewees agreed that communication and coordination is excellent, though some partners' Internet connection is not always able to support effective participation in scheduled meetings. The ME noted that it has been a challenge to convince some Mission staff of the need for R4D-type research. Both the ME and USAID staff reported that funding cycles affect the ability of USAID and USAID-funded projects to engage meaningfully with SIL.	The ME has found effective ways to communicate SIL's R4D approach to others, though more effort is needed to develop greater support for R4D within USAID. Poor Internet connectivity in some host countries hampers effective communication and participation in meetings. Effective communication and coordination are essential to building and maintaining genuine, meaningful partner relationships that provide the basis for effective R4D. Project cycle timing is critical for USAID Missions and USAID-funded projects to engage with SIL.

FINDINGS	CONCLUSIONS
EQ 1.3: To what extent has the ME been effective in establishing partnerships with other sectors (private sector, NGOs, USAID Missions, etc.) to help achieve its targets and support the dissemination of research findings as a way to promote sustainable production and utilization of soybean? What opportunities are there to expand collaboration with other relevant partners?	
The ME has been effective in identifying and establishing linkages with a range of partners, including NGOs, private sector, host country government organizations, host country universities, and others. PIs are important in maintaining and building relationships with partners in-country. The value chain approach taken to date has focused mainly on partnerships with those promoting soybean production and small-scale processing. Funding cycles are such that donor-funded programs are often unable to develop activities with SIL unless these have been incorporated into the project design at the start of a project. Two NGO partners stated that research outputs are not necessarily packaged in a way that can be easily understood and used by partners.	The ME has been very proactive in effectively identifying and establishing linkages with a range of partner types. A more comprehensive value chain focus requires expanding collaborations with partners involved in marketing to promote market linkages along the value chain. NGO partners required outputs that can help them disseminate SIL products to their clients.
EQ 2.1: To what extent did the SIL generate quality research technologies/outputs using appropriate metrics (e.g., peer reviewed publications)? Are the outputs relevant and appropriate for a demand-driven R4D project (e.g., did they generate/develop new technologies of relevance to Feed the Future countries that practitioners and/or small-holder farmers are likely to use)? What opportunities are there to improve research outputs (in terms of both increasing quality and generating appropriate outputs for Feed the Future countries) moving forward? Describe and highlight which research technologies have had the greatest impact or potential for the greatest impact.	
All 18 R4D products reviewed by the Evaluation Team (ET) were likely to be used or taken up by a wide range of stakeholders (researchers, practitioners, policy-makers, farmers and/or consumers, and processors and/or entrepreneurs). For example, 16 out of the 18 products reviewed were relevant and appropriate for a demand-driven R4D project in that they involved technologies/outputs that practitioners, farmers, and/or entrepreneurs were likely to use. There seemed to be less consistency on how the R4D product concept is applied across MRAs. Some products required additional customization to make them more likely to be used or taken up. There appears to be no systematic feedback from the users of products to the SIL research team. Various market gaps exist in the soybean value chain.	Sixteen (16) out of the 18 products reviewed were relevant and appropriate for a demand-driven R4D project in that they involved technologies/outputs that Feed the Future practitioners, farmers, and/or entrepreneurs were likely to use. The articulation of development pathways is a useful way of checking that a particular product has all the components or associated outputs necessary for its uptake and that it will lead to developmental impacts. Greater consistency is needed across MRAs in applying the R4D product concept. Systematic feedback from the users can help to ensure that the outputs are relevant and appropriate. More R4D outputs are needed to address gaps in market linkages for both input and output markets.

FINDINGS	CONCLUSIONS
EQ 2.2: How effectively has the SIL fostered dissemination of research results to local stakeholders at all levels? In what ways could dissemination be improved (both content and audience) to enhance the uptake of research findings?	
SIL uses a range of dissemination channels; key informants found the monthly and weekly digests very informative and also appreciated the video-based communications products available on the website. Feedback on the annual events was more mixed. The effectiveness of dissemination of R4D products depends partly on the level of "completeness" of the product development process. Only one of the four development partners interviewed could clearly articulate their information needs for soybean promotion. SIL PIs understood that they should not be conducting extension activities, yet some of the activities undertaken by SIL are best regarded as extension.	SIL is very effective in disseminating research results at the overall program level, although there is room for improvement in dissemination at the MRA and product levels. Research outputs/products and their dissemination are more easily accomplished and with greater efficiency when PIs are aware of what is needed by practitioners. This knowledge can be gained through discussions by SIL with development practitioners. The lack of a role for extension activities within SIL needs to be addressed in any future programs similar to SIL in order to support practitioners' extension efforts to ensure effective promotion and sustainability of SIL products. It is essential that information regarding the use and uptake of the products by farmers/entrepreneurs/processors is fed back to the researchers to ensure that the products are appropriate in different contexts, and to highlight any changes or modifications that may be needed.
EQ 2.3: How well has the program identified and addressed academic and technical capacity needs of host country stakeholders? How could the project better serve and provide for the capacity needs of these stakeholders?	
Academic capacity development has taken place through the Plant Breeding Masters course; internships; and MS/PhD courses and fieldwork. Technical capacity development has focused on individual breeders and their technicians; technicians in the Environmental Lab; technicians and farmers on the safe use of pesticides; Soy Dairy Network members; thresher manufacturers; and development practitioners promoting nutrition. The impact of capacity development varied according to the individual's technical ability, energy, and institutional support. NGOs and research partners requested more training.	Capacity needs tended to be identified by the PIs through their experiences in working with particular partners/individuals. SIL has been successful in enhancing the capacity of students despite the fact that this is not a core component of the SIL approach. With the exception of nutrition, technical capacity development has tended to focus on research partners rather than devzelopment partners. Building capacity for training, e.g. through training of trainers (ToTs), is an effective way of reaching more people in country.

FINDINGS	CONCLUSIONS
EQ 2.4: How proactive was the ME in responding to research challenges and expanding beyond the scope of the original proposal?	
One of the overriding research challenges for the ME has been in implementing an R4D approach that is appropriate to the situation on the ground with a lack of flexible funding. SIL's research activities had to be adapted from the original proposal after PIs visited the project areas. Despite a lack of discretionary funds, the ME has been able to re-allocate and source small amounts of funds through its close relationships with partners. However, not all attempts to source additional funding have been successful. The ME has been disappointed by the apparent lack of associated funding available in country through USAID Missions. New funding proposals have been submitted to a range of donors, with a roughly 50 percent success rate.	The ME has been very proactive in responding to research and funding challenges. A lesson relevant to other R4D projects is the importance of understanding the in-country context of development and on-the-ground realities prior to designing an R4D program. For those not familiar with the target country / region, an in-country visit is essential as part of the design process. ME has shown initiative and imagination to go beyond the scope of project and overcome research and funding challenges.
EQ 3.1: How has the ME performed in establishing productive collaborations with host country governmental and academic institutions, local NGOs, other Feed the Future Innovation Labs, and other relevant USAID programs in the target countries? How could the ME improve in building its institutional collaborations as a way to support institutional capacity building?	
The report provides numerous examples of where productive collaborations/linkages have been established by the ME and PIs. The ME expressed frustration in its attempt to link with some USAID Missions in order to help build capacity for scaling up the development efforts that are supported through USAID Mission funding.	A wide range of productive collaborations have been successfully established by the ME and developed by the PIs to support institutional capacity building. This includes: the provision of physical infrastructure and other resources, outputs, or products; training and human capacity development; joint proposal development and joint funding awards; and networking, linkages, and knowledge-sharing among and between partners. USAID has a role to play in supporting institutional capacity development through R4D. The need for capacity building in both infrastructure development and training for in-country researchers and technical staff at national agricultural research centers cannot be underestimated. There is potential to build on and expand the networking and linkage activities to further support institutional capacity development.

FINDINGS	CONCLUSIONS
EQ 3.2: In what ways has the ME been responsive to requests for technical assistance from USAID (HQ and Missions) and host country institutions? In what ways could the ME have been more responsive?	
The ME receives requests for technical assistance on a weekly basis and responds to these requests within a one-week time frame. After an initial email response, the ME then dialogues with the requesting organization and forms consortia with SIL PIs and other partners to develop proposals so they can access the funding needed to engage in more formal activities. In this way, many of the people/organizations making requests eventually become SIL partners. The majority (75 percent) of requests for assistance come from development organizations and private sector companies—both types of organizations for which SIL (as a research entity) might otherwise find it difficult to establish links.	SIL responds to a high volume of technical requests in a timely and thorough manner. The ME's ability to link different organizations into consortia allows for the development of innovative approaches that respond directly to the needs of the partners (as articulated in their original request for assistance) as well as create opportunities for expanding the R4D work of the SIL Program. The SIL Program is constantly innovating and expanding its work and its reach, yet the human capacity (in terms of personnel and time) has remained more or less constant, with only additional (yet temporary) support from interns. It is vitally important for SIL to continue to respond to requests for assistance in order to continue to develop partnerships with development organizations and private sector companies for a successful, demand-driven R4D approach.
Q 4.1: What specific areas in soybean production and utilization in SSA merit new or continuing investment, including technical research (e.g., breeding vs. feeds development vs. post-harvest management), capacity development and institutional support, and dissemination?	
A. R4D Approach and Partnerships	
SIL has successfully developed an R4D approach that is focused on tangible R4D products. As part of this approach, it has invested considerable time and effort in developing genuine, meaningful partnerships.	When applied consistently across the program, SIL's R4D approach ensures that the products generated are taken up by development partners to achieve developmental impacts. The ways in which SIL creates and develops R4D partnerships supports new and innovative solutions to practical problems.
B. Technical Research	
Technical research accounts for 69 percent of the total research budget to date. More than 30 percent of the total research budget is invested into practical breeding activities across five countries to support the development of six R4D products. Eighteen (18) percent of the total research budget is invested into the SMART Farm. The main challenges of the SMART Farm to date have been its narrow technical focus and lack of extension outputs. Smaller investments have been made in nutrition and mechanization, but the ways in which the research has been designed and undertaken have a high likelihood of achieving development impacts. Three technical areas - environmental impacts, seed systems, and pest/disease management - have received extremely small investments to date	The level of investment into breeding is considered appropriate in view of the likely development impacts of the new varieties to be produced and the trialing approaches developed. It will be necessary for appropriate, sustainable seed systems to be developed to allow farmers to access the new varieties. The way in which technical research is undertaken is crucially important within an R4D setting.

FINDINGS	CONCLUSIONS
C. Dissemination, Extension, and Feedback	
The evaluation has shown that there is a fine line between dissemination, training, and extension. Currently, SIL does not collect systematical feedback on the use of its products.	Without investments in extension-related activities, SIL's R4D products will not be taken up by their intended users. Extension involves a two-way flow of information. It is necessary for SIL to gather feedback on the use of its products (by development practitioners, farmers, and entrepreneurs) to ensure that the products are appropriate in different contexts, and to make any necessary adjustments or improvements.

RECOMMENDATIONS

Recommendations for each theme are presented in order of priority (HP – high priority, MP – medium priority).

Program Management and Partnerships

[HP] The ME should foster **greater research consistency of the overall research program and greater integration across MRAs where appropriate**. This can be achieved mainly through, a joint-PI planning for the development of R4D products that require an integrated research approach.

[HP] **The ME should enhance its capacity in administrative and coordination** to allow SIL to continue to respond to requests for technical assistance in a timely and efficient manner for the establishment of successful demand-led R4D partnerships and activities.

[HP] **Any future SIL budget should include flexible funds for multiple purposes**, such as: a) funds for collaborating, learning and adapting (CLA) that allow SIL to address the needs of its partners and support partner learning processes; b) discretionary funds for use in situations where monetary needs are required in an immediate (timely) manner for on-the-ground challenges or shortfalls faced by PIs or SIL partners to meet priorities of SIL and USAID; and/or c) in-house competitive grant awards for PIs and/or partners.

[MP] **The ME should continue to identify and establish new types of partnerships**. Partnerships should be expanded to include a greater focus on market linkages and value chain actors further downstream in the chain, i.e., those who create demand for soybeans. Where appropriate, the ME should work with partners to facilitate the emergence of an innovation platform to allow value chain actors and stakeholders to interact with each other and develop and test solutions to challenges that they identify themselves, with support from SIL researchers.

R4D Research Approach

[HP] For efficient research design, effective dissemination, and successful uptake, **the R4D product concept should define and tailor them to target audience from the starting point of the research design and planning to the end**. In this case: a) R4D products should be uniquely articulated, each with a defined set of users; b) the research planning process should include the articulation of development pathways to ensure that a particular product includes all the components necessary to ensure its uptake; c) wherever possible, users should be involved in the development and testing of the product to ensure relevance and appropriateness; d) for 'technology' products, the following associated outputs should be developed to support their successful uptake i) evidence or

proof to show that the product is indeed viable, effective, and/or beneficial; ii) extension information that can be used by development practitioners in promoting the product among users; and iii) promotional materials such as fact sheets that can be used to create awareness of and demand for products and associated services among practitioners and policy-makers; and e) dissemination should be regarded as part of the research process to ensure that the product will reach the intended end users.

Dissemination

[HP] SIL should ensure that research findings are presented and packaged in a way that partners can easily understand them. SIL should develop a **range of standardized communications outputs so that there are appropriate outputs for each different types of partner/stakeholder**.

[HP] It is recommended that SIL produces a **short briefing paper describing its R4D approach** and that this is presented and disseminated among USAID staff at Headquarters (HQ) and the Missions, as well as USAID contractors and development partners.

Training and Capacity Development

[HP] **Training and training tools for development practitioners promoting soybean production should be developed and tailored to the requirements of specific partners**.

[MP] To ensure that the quality of the training and training courses provided by SIL remains consistently high, the ET recommends that SIL maintain an **on-going partnership with the implementing organizations/donor-funded development projects that deliver SIL training courses**.

[MP] Key **individuals and partner organizations targeted for substantial capacity development should be carefully selected and vetted** by the SIL ME and PIs.

Institutional Capacity Building

[MP] **SIL should continue to support institutional capacity building through its collaborations with partners and projects.** SIL may also consider: a) expanding networking and linkage activities among value chain actors to support development at all levels of the value chain; and b) as appropriate, creating in some countries a national or regional soybean innovation platform or soybean association, facilitated by an appropriate partner.

[MP] **USAID Missions and HQ should proactively encourage R4D-type collaborations** to support institutional capacity development for USAID contractors and other development agencies. This can be done by: a) encouraging Missions to promote CLA within their projects so that they have the flexibility to develop partnerships that can support institutional capacity development; b) organizing in-country partner meetings to include entities supported by USAID HQ and the USAID Mission; c) having a Mission-based position to coordinate projects funded by HQ and those funded by the Mission; and d) encouraging Missions and HQ to liaise over the timing of their respective new program cycles and build in collaborations from the start.

Future Investments

[HP] **It is recommended that USAID funds extension programming** in any future SIL Program to move the project forward.

[HP] Investment into the **SMART Farm should continue and should adopt:** 1) **a more inclusive, inter-disciplinary approach so that it provides a genuine "hub"** that encompasses a much

broader range of SIL's research; and 2) incorporate **an extension component** to enhance its ability to provide recommendations and capacity development for the benefit of the development practitioners and, ultimately, the end users.

[HP] **More research and R4D outputs/products are needed to address the various gaps in market linkages for both input and output markets, as well as demand for soy food products.** R4D products should be prioritized within specific research areas according to in-country needs.

[HP] It is recommended that SIL's current investments in technical research areas should continue and that **particular attention should be given to how technical research is designed and undertaken**. Specifically, technical research should be designed and implemented collaboratively with development partners and end users. During development and testing of R4D products, ensure that the development partners have the necessary technical knowledge to promote the technologies.

[HP] Continued and **increased investment is warranted for:** i) **monitoring and reducing the negative environmental impacts** of agro-chemicals used in the soybean value chain; ii) **seed systems** to ensure the multiplication and dissemination of SIL's improved varieties; and iii) **pest/disease management** (in addition to identification).

[MP] The ET recommends a basic yet explicit **value chain mapping and analysis** to help SIL determine sources of current (and potential) demand for soybean in each country and the markets and market linkages that need strengthening within the chain. Once established, actors from different nodes of the value chain can work together with an innovation broker (e.g., a researcher or development practitioner) to identify challenges and constraints and find ways to address them.

1.0 EVALUATION PURPOSE AND QUESTIONS

1.1 EVALUATION PURPOSE

The Feed the Future Innovation Lab for Soybean Value Chain Research—the Soybean Innovation Lab (SIL)—is part of the *Feed the Future Global Hunger and Food Security Research Strategy*. SIL was funded by the United States Agency for International Development Bureau for Food Security (USAID/BFS) from November 2013 through November 2018. SIL was designed to perform research that addresses factors limiting adoption and sustainability of soybean production, processing, and consumption in sub-Saharan Africa (SSA). The program also aims to translate knowledge to key stakeholders, including development practitioners,[4] the private sector, and government agencies. The final performance evaluation of SIL was conducted from May through December 2017, by a team of three experts contracted under the Program Evaluation for Effectiveness and Learning (PEEL), led by Mendez England & Associates (ME&A).

The purpose of the evaluation was to assess SIL's performance and provide robust evidence-based findings, conclusions, and recommendations to inform decision-making on the future of the program. The evaluation also identifies future needs for further investment relating to the promotion of the soybean value chain for smallholder farmers in developing countries. The evaluation accomplished this by assessing implementation and progress toward objectives among the different SIL components, including research and dissemination, the relevance of research, technology development, and capacity building accomplishments.

1.2 AUDIENCE

The primary target audience of this evaluation is the USAID's BFS Office for Agriculture Research and Policy (ARP), who will use the findings of this evaluation to help guide the future direction of the program in terms of strategies and investments. The secondary target audience includes USAID Missions, implementing partners (IPs), and researchers. Results from the evaluation will be used to guide research and implementation of similar programs dealing with high-protein legumes in SSA and beyond.

1.3 EVALUATION QUESTIONS

As per the Expression of Interest (EOI) presented in Annex 1, the evaluation questions (EQs) are related to three aspects of the SIL Program implementation: program management; research and training program; and institutional collaboration and to overall program future. The EQs are presented below:

Program Management

1. To what extent has the Management Entity (ME) effectively implemented and managed the SIL's respective research, training, and dissemination activities and how could this process be improved in future programs?
2. How effectively did the ME communicate and coordinate with USAID/BFS, USAID Missions, partners, host country government partners, local researchers, and other stakeholders as a way to better achieve project goals and objectives; create and carry out a shared research agenda; improve the capacity of local researchers; and improve dissemination?

[4]The term "development practitioner" is used to refer to government and non-governmental organization (NGO) agencies and individuals who are actively involved in the practice of development, as opposed to those involved in research or policymaking. Government extension agents are considered to be development practitioners.

3. To what extent has the ME been effective in establishing partnerships with other sectors [private sector, non-governmental organizations (NGOs), USAID Missions, etc.] to help achieve its targets and support the dissemination of research findings as a way to promote sustainable production and utilization of soybean? What opportunities are there to expand collaboration with other relevant partners?

Research and Training Program

1. To what extent did the SIL generate quality research technologies/outputs using appropriate metrics (e.g., peer-reviewed publications)? Are the outputs relevant and appropriate for a demand-driven research-for-development (R4D) project (e.g., did they generate/develop new technologies of relevance to Feed the Future countries that practitioners or small-holder farmers are likely to use)? What opportunities are there to improve research outputs (in terms of both increasing quality and generating appropriate outputs for Feed the Future countries) moving forward? Describe and highlight which research technologies have had the greatest impact or potential for the greatest impact.
2. How effectively has the SIL fostered dissemination of research results to local stakeholders at all levels? In what ways could dissemination be improved (both content and audience) to enhance the uptake of research findings?
3. How well has the program identified and addressed academic and technical capacity needs of host country stakeholders? How could the project better serve and provide for the capacity needs of these stakeholders?
4. How proactive was the ME in responding to research challenges and expanding beyond the scope of the original proposal?

Institutional Collaboration

1. How has the ME performed in establishing productive collaborations with host country governmental and academic institutions, local NGOs, other Feed the Future Innovation Labs, and other relevant USAID programs in the target countries? How could the ME improve in building its institutional collaborations as a way to support institutional capacity building?
2. In what ways has the ME been responsive to requests for technical assistance from USAID (Headquarters and Missions) and host country institutions? In what ways could the ME have been more responsive?

Program Future

1. What specific areas in soybean production and utilization in SSA merit new or continuing investment, including technical research (e.g., breeding vs. feeds development vs. post-harvest management), capacity development and institutional support, and dissemination?

2.0 PROJECT BACKGROUND

2.1 CONTEXT

Feed the Future Global Hunger and Food Security Research Strategy was created by USAID/BFS to provide an opportunity to link universities in the United States (U.S.) and in other developing countries, with foundations, private sector institutions, and NGOs to investigate various key research activities of distinct programs under the Feed the Future Initiative. The SIL Program is part of this strategy and was designed to perform research that addresses factors limiting the adoption and sustainability of soybean production, processing, and consumption in SSA as well as translating knowledge to key stakeholders, including development practitioners, the private sector, and government agencies.

SIL's overall approach is based on four R4D pillars that comprise the essential components of sustained production, improved household nutrition, and sustainable market linkages for soybean farmers. The four pillars are:

1. Genetic Improvement through an Accelerated Seed Production System;
2. Enhanced Crop Productivity and Quality through Soybean Management with Appropriate Research and Technology (SMART) Farms;
3. Human Nutrition and Utilization;[5] and
4. Value Chains, Gender, and Socio-Economic Research.

Specifically, the SIL Program identifies, adapts, and deploys evidence-based technologies and innovations across the soybean value chain to 1) improve soybean plant breeding programs in SSA; 2) educate the next generation of plant breeders in Africa; 3) prescribe the best agronomic practices for successful soybean production and seed management; 4) identify barriers to adoption of soybean production for smallholder farmers in SSA; 5) analyze the role of gender in production, consumption, and micro-enterprise owners of soybean; 6) define the necessary conditions to ensure environmentally-friendly soybean production practices; and 7) develop practices for sustained utilization of soybean at the institutional, household, and micro-enterprise levels.

SIL partners with land-grant universities in the U.S. to lead activities and projects in Africa, which are implemented by in-country partners, often national agricultural research institutes. The University of Illinois at Urbana-Champaign is the lead university and defined as the ME. Other lead partners include the University of Missouri (UOM), Mississippi State University (MSU), and the International Institute for Tropical Agriculture (IITA) of the Consultative Group on International Agricultural Research (CGIAR) (see Annex 2). Other types of SIL partners include local organizations, government entities, and institutions, USAID Mission contractors, or private sector firms to promote institutional change and sustainability of SIL's transformative efforts. SIL collaborates actively with partners who reside outside of Africa, for example, the Syngenta Foundation, as well as other Innovation Labs such as the Post-Harvest Loss Reduction Lab, U.S. Department of Agriculture-Agricultural Research Service (USDA-ARS), and other U.S. universities for joint work in Africa. SIL's initial activities were centered in Ethiopia, Ghana, Malawi, Mozambique, and Zambia. However, since 2013, SIL's geographical reach has expanded to 16 additional countries including Angola, Argentina, Benin, Colombia, Côte d'Ivoire, Indonesia, Kenya, Liberia, Mali, Nigeria, Pakistan, Rwanda, Sudan, Tanzania, Uganda, and Zimbabwe.

The SIL Program uses a coordinated integration of fundamental research, human and physical capacity building, and communication with stakeholders across the four pillars of the program. Within each pillar,

[5] The original SIL proposal included a module on livestock nutrition, but this was replaced with human nutrition at the request of the reviewers. The SIL Program is still interested in supporting livestock nutrition, particularly because 98 percent of soybean production in Africa is used in livestock feed, and there is high development potential for the poultry and aquaculture sectors.

there are two or three Managed Research Areas (MRAs), as indicated in Annex 2. Each MRA is led by a Principal Investigator (PI) from one of the partner land-grant universities.[6] Annex 2 lists the key partners associated with each MRA, including three host-country national agricultural research centers, five university/academic institutions, 10 NGOs or donor-funded organizations, and seven private sector entities. Other local partners are supporting various R4D activities not included in the diagram. Activities undertaken with both research and development partners[7]focus on 23 R4D products, as listed in Annex 6. It is important to note that SIL's primary beneficiaries are not smallholder farmers but the partner research organizations and practitioners that aim to develop the soybean value chain.

2.2 SIL'S R4D APPROACH

The R4D approach adopted by SIL provides an important context to the Program, most notably in the ways that research is understood and conducted, and in the ways that SIL works with its partners. R4D is essentially concerned with how research can contribute towards longer-term development goals. In the case of SIL, a key question is whether soybean (as a commercial, global crop that is still relatively new to Africa) is an effective development crop and, if so, how can it help smallholder farmers in Africa to move out of poverty? In answering these questions, the SIL research program takes a multidisciplinary and practical approach towards meeting the needs of its partners, most notably the development practitioners.

All R4D research within the SIL Program is conducted in the countries where SIL is operational. Because SIL does not have a permanent presence in these countries, all research is implemented through in-country research partners. For this to be successful, a considerable amount of capacity development for in-country researchers is required. Capacity development within the SIL Program focuses on the capacity to undertake practical research as opposed to academic research; for this reason, SIL does not have a formal academic training program for students.

Within SIL's R4D approach, the link between SIL and its development partners is also particularly close; SIL engages directly with partners, listens to partner needs, and is in constant communication with its development partners. Research outputs should be closely aligned with the needs of the partners and presented or packaged in a manner that is appropriate to the partners (as opposed to an academic audience). This style of working is very different to the type of research that is typically undertaken by universities. In some cases, it is also very different to how development practitioners have tended to operate. As this report will show, there have been challenges and frustrations in implementing an R4D approach that stem from a lack of familiarity or experience in its application by both researchers and development practitioners as well as structural issues relating to funding sources and project cycles.

The concept of "R4D products" has been developed by the SIL's ME to help articulate the research outputs that are available for uptake by development partners. SIL describes R4D products as evidence-based technologies or "solutions" that are ready to be implemented at scale. The Evaluation Report explores SIL's application of the R4D product concept and how it might be enhanced.

2.3 SIL RESULTS FRAMEWORK

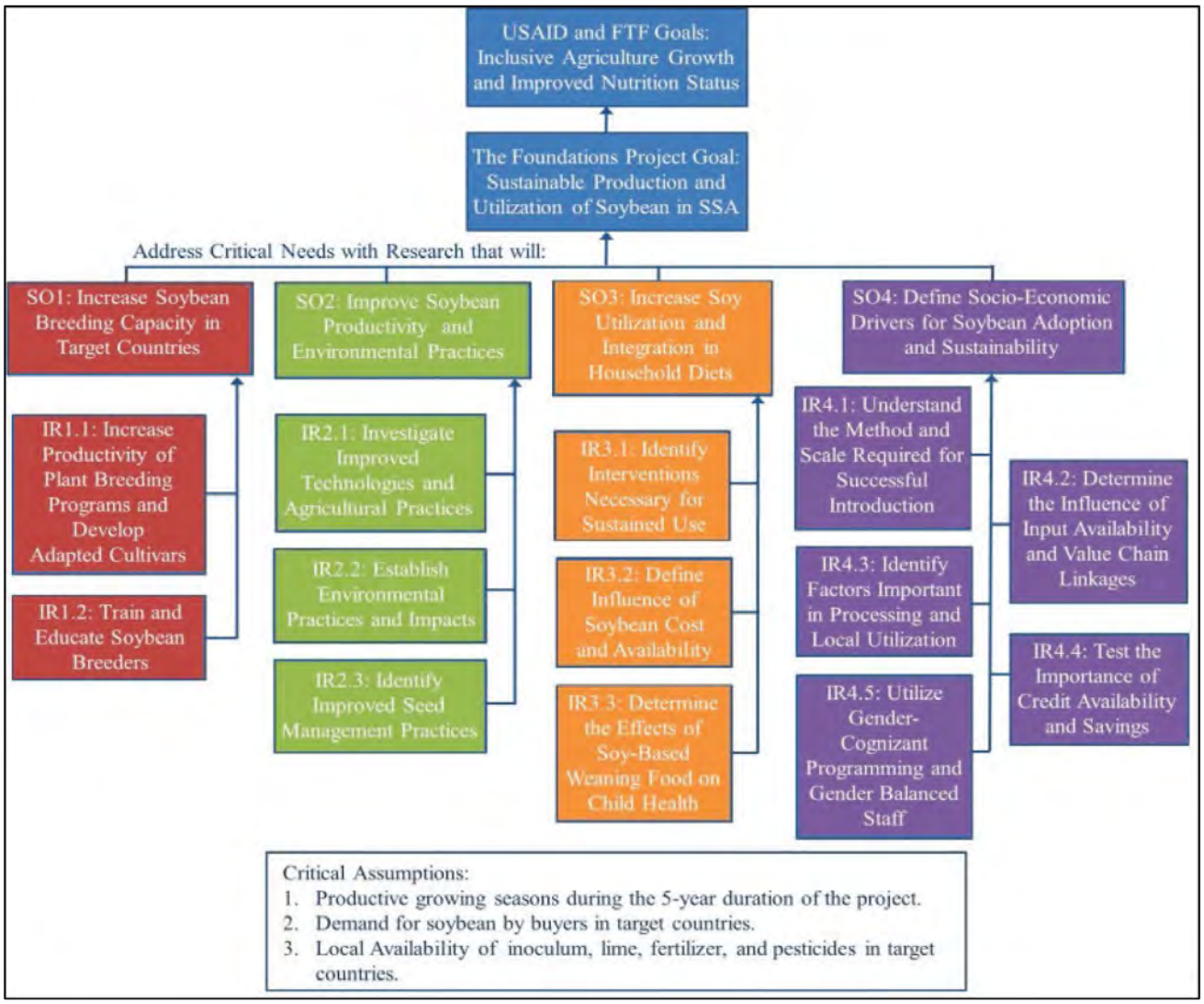
The overarching goal of SIL is to support the sustainable production and utilization of soybean in SSA through an R4D approach. SIL Program's achievements are expected to contribute to the USAID and Feed the Future objectives of inclusive Agriculture Growth and Improved Nutritional Status. SIL's

[6] One exception is the MRA on Utilization for Livestock Nutrition, led by a researcher from the University of Georgia.

[7] In this document, the evaluation team refers to "research partners" as the national and international agricultural research systems and the universities and academic institutions; "development partners" are the NGOs and donor-funded projects. Private sector entities can be either research partners or development partners, depending on their function.

activities are guided by four strategic objectives (SOs) and intermediate results (IRs) as reflected in the results framework of Figure 1.

Figure 1. SIL Results Framework[8]



[8] Source: SIL Program Document: University of Illinois, Urbana-Champaign (2013): "Foundations for Soybean in Africa: A proposal to United States Agency for International Development," p. 23. Note that inclusive agricultural growth and improved nutritional status are FTF objectives, not goals.

3.0 EVALUATION METHODS AND LIMITATIONS

3.1 EVALUATION METHODOLOGY

The evaluation adopted a mixed-method approach that included qualitative and quantitative data collection methods to address the key questions. Data collection tools are presented in Annex 3. Given the short duration and limited resources, the team visited two countries (Ethiopia and Ghana) out of the five main countries where SIL is active. The travel itinerary is presented in Annex 4. Ethiopia and Ghana were purposively selected for field data collection because 1) Ghana has many SIL activities clustered, which also provides the "proof of concept" for the SIL approach; and 2) Ethiopia reflects SIL's growth strategy.[9] There is one additional key difference between Ethiopia and Ghana—USAID prioritizes the soybean value chain in Ghana but not in Ethiopia, where the poultry value chain is prioritized. Though soybean is the main ingredient in poultry feed in Ethiopia, this variance provided an opportunity for the ET to assess two distinct approaches.

3.1.1 Qualitative Methods

The ET employed a number of qualitative methods to collect data for this evaluation, which include:

1. A review of major program documents and resources, including annual and semi-annual reports; Advisory Board meeting resources; internal presentations and research reports; internal trip reports; and dissemination outputs. Notes from the documentation review were recorded using the template in Annex 3.12.
2. Key informant interviews (KIIs) with the main stakeholders, including the ME; PIs; research and development partners; and USAID Headquarters (HQ) and Mission staff (see Table 1 and Annex 5). A list of proposed Key Informants (KIs) was initially drawn up by the ET, based on names and information gleaned from the documentation review. This list was then shared with the ME who provided additional information on one or two of the proposed individuals (i.e., regarding their role and location), which subsequently led to their removal from the list. Two or three additional KIs were later added following suggestions and recommendations by the ME and also those interviewed. The Evaluation Team (ET) ensured adequate representation of KIs from each of the categories listed in Table 1, and particular efforts were made to ensure good representation of development partners, given the R4D approach of the SIL.
3. A group discussion with the PIs focusing on the R4D approach and potential for development impacts. This discussion was deemed to be necessary given the centrality of the R4D approach to the project and the lack of SIL documentation describing this approach. The ET was particularly keen to see how the PIs themselves understood the R4D approach and what lessons they had learned through applying it.
4. Direct observation of two key program-related events—the Annual Kick-Off Event and the Soy Food Bazaar held in October 2017 in Tamale, Ghana. It was fortunate that the evaluation schedule coincided with these events, which offered an excellent opportunity not only to see SIL's activities and products, but also to observe the interactions between the SIL Team, partners, and stakeholders and to gather informal feedback from a wide range of event

[9] SIL started in Ethiopia with just one MRA in 2013, and is now bringing in MRAs 3 and 5, in addition to MRA 1; the national agricultural research station at Jimma has recently established a SIL SMART Farm and will become a site for the Pan African trials. SIL has attracted additional funding from USDA to extend the Kickoff and Bazaar events to Ethiopia. SIL is also expanding its activities with the soy food industry and soy milk producers in Ethiopia.

participants. The Kick-Off Event allowed the ET members to gain information from farmers and traders, and Soy Food Bazaar made it possible to see (and taste) the range of soy food products available in northern Ghana and to compile informal feedback from consumers.

5. Review and case studies of R4D products: 18 of the 23 products were assessed according to their likely uptake and impact (Annex 6), and eight selected products were the focus of case studies relating to the partners involved, relevance, dissemination, capacity development, and potential for impact (Annex 7). Given that the R4D products comprise the main SIL outputs, the ET considered it necessary to review as many of these as possible. Case study products were selected according to the expertise of the ET members, the relative "size" of the products (based on budget), and their level of completeness. Although 15 case study products were originally selected, these took longer than initially assumed. Ultimately, the ET undertook nine case studies, and supplemented them by assessing 18 products presented in Annex 6. Data for the case studies and assessments were drawn from project documentation, interviews, and first-hand observations.

Notes from interviews, discussions, and observation were recorded using the template in Annex 3.13. Relevant sections from these notes and notes from the document review were copied and pasted into separate documents relating to each of the EQs—all information and preliminary analysis compiled for each EQ was contained in a single document.[10] Further, a more detailed analysis was done by comparing and triangulating information from different sources and data collection methods; summarizing, synthesizing, and categorizing the information; highlighting recurring themes; noting any gaps; and, to ensure completeness, searches for key words across the various EQ documents.

During the data collection phase, the three members of the ET regularly discussed and compared their emerging findings and conclusions, allowing for team member triangulation, through which individuals with different expertise assess the same issues. Towards the end of the fieldwork period, a joint analysis session took place at which the three members of the ET discussed and drafted a preliminary Findings, Conclusions, and Recommendations Matrix. This draft matrix was subsequently cross-checked, refined, and elaborated based on the findings and conclusions that emerged from the more detailed analysis described above.

3.1.2 Quantitative Methods

Quantitative data were collected through an online survey (Annex 4.10) sent to 135 SIL team members and partners across the various countries. Although online surveys typically have relatively low response rates,[11] this survey allowed for quantitative data to complement the qualitative data, and for data to be collected from countries the ET was not able to visit. Thirty-six responses were received from more than eight countries, and 35 responses included the completed survey. The 26 percent response rate was slightly higher than the 20-25 percent response rate that the ET had anticipated. A recent SIL survey on communications products had a response rate of less than one percent,[12] whereas an earlier SIL survey (on gender responsiveness) achieved a 36 percent response rate. The ET sought advice from the SIL Gender Team on how best to ensure a good response rate and incorporated the following three factors into the survey design short, concise questions; a short time for completion (15 days); and two or three email reminders. The survey results are provided in Annex 8.

[10] All names of individuals were excluded from the EQ documents to protect the identity of individuals, though the information source can be traced by members of the ET using the coding system.

[11] Internal surveys (e.g., among employees) generally receive a 30-40 percent response rate, whereas external surveys (e.g., among customers) have an average 10-15 percent response rate (https://www.surveygizmo.com/survey-blog/survey-response-rates/). Another source gives an average email survey response rate of 24.8 percent (http://fluidsurveys.com/university/response-rate-statistics-online-surveys-aiming/).

[12] Eleven responses were received from a mail list of approximately 4,500.

Table 1. Number of Respondents by Data Collection Method by Country

Data Collection Method	USA	Ghana	Ethiopia	Remote	TOTAL
Key Informant Type					
ME & Advisory Board	**8**	**1**		1	**10**
Principal Investigators	**11**				**11**
Associate Investigators & Research Partners	**6**	**6**	**4**	2	**18**
Development Partners		**9**	**2**		**11**
Private Sector		**3**			**3**
USAID		**1**	**1**	1	**3**
Graduate Students	**2**	**1**			**3**
TOTAL	**27**	**21**	**7**	4	**59**
Group Discussion with PIs	**9**				**9**
Online Survey				35	**35**

3.2 EVALUATION LIMITATIONS

The ET visited only two purposively selected countries, Ethiopia and Ghana; therefore, the results are not generalizable to all SIL Program sites. To address this limitation, the ET reviewed project documentation encompassing all countries (e.g., annual reports, Advisory Board resources), and a key trip report for southern Africa. Remote interviews were conducted with KIs responsible for activities in southern Africa and the online survey sent to partners and stakeholders in all SIL-active countries. The ET also had an opportunity to conduct a face-to-face interview with two KIs from a partner organization in Malawi who were visiting Ghana at the same time as the ET.

The ET considered the response rate for the online survey (26 percent) acceptable, although, due to possible selection bias (perhaps only those who had positive views about the program were motivated to participate), the results cannot be regarded as representative. The ET used a series of key KIIs, group discussions, document review, and observations to address this limitation and help triangulate the findings.

The reliance on mainly qualitative data may make the analysis susceptible to biases in interpretation by the ET members.

One of the three events in which the ET was scheduled to participate—the World Soybean Research Conference, in Savannah, Georgia in October 2017—was cancelled due to Hurricane Irma.

4.0 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

4.1 EQ 1.1: PROGRAM MANAGEMENT – TO WHAT EXTENT HAS THE ME EFFECTIVELY IMPLEMENTED AND MANAGED SIL'S RESPECTIVE RESEARCH, TRAINING, AND DISSEMINATION ACTIVITIES? IN WHAT WAYS COULD IMPLEMENTATION AND MANAGEMENT BE IMPROVED?

4.1.1 Findings

All informants highly praised the ME regarding implementation and management. According to the online survey conducted by the ET, 69 percent of respondents rated it as "excellent" and 20 percent as "good." The ET learned that the ME has set a good "tone" for the SIL team, providing supportive leadership and mentorship as well as effective administration to ensure efficiency and productivity. The ME had put in place mechanisms of monitoring and managing progress as well as identifying any issues and addressing them. For example, the ET was told of a case where a PI had to be replaced for lack of productivity, illustrating an action taken by the ME to ensure productivity. Monthly GoToMeeting web conferences are well-organized and keep team members up-to-date on SIL activities. The only negative comment regarding the ME pertained to delays in disbursing funds to other partners in a timely manner. The ME referred to USAID's delay in disbursing funds as a major challenge and the main reason the ME, in turn, delayed distributing funds. The ME noted that funding is awarded in October, but often do not actually come to the University of Illinois until December or January for subsequent redistribution to partners. The delayed funding was said to be affecting program activities as well as the relationships between the ME and their partners. The majority of partners that were interviewed in the U.S. and Africa said that they understand the situation and recognize that there is little the ME can do to expedite the funding process.

Regarding research management, the research itself is designed and managed by the MRA PIs with general oversight and guidance from the program director. As such, the structure of the research program and the capacity of the PIs both play a key role in research design and its management. The research is broadly structured by the four R4D pillars as well as the SOs and IRs of the Results Framework as explained earlier, which are designed to take advantage of disciplinary strengths of the land-grant universities and their collaborating cluster of research institutions (see Annex 2). The PIs have considerable autonomy in designing their MRAs. However, comments from PIs indicated their desire for more interaction and information-sharing across-MRAs arguing that decentralization risks creating a "silo-effect" unless efforts are made to share knowledge and integrate the research across the MRAs. They noted that it might be necessary for the program director to play a more proactive role in research design to ensure the overall consistency across the MRAs. While there is good consistency between the first three pillars and their respective SOs/IRs, the fourth SO does not appear to be as well-aligned with the fourth pillar (e.g., in the relative emphasis given to value chains and market linkages) and contains five IRs (as opposed to two or three, as for the other SOs), which—in hindsight—may have been overambitious.

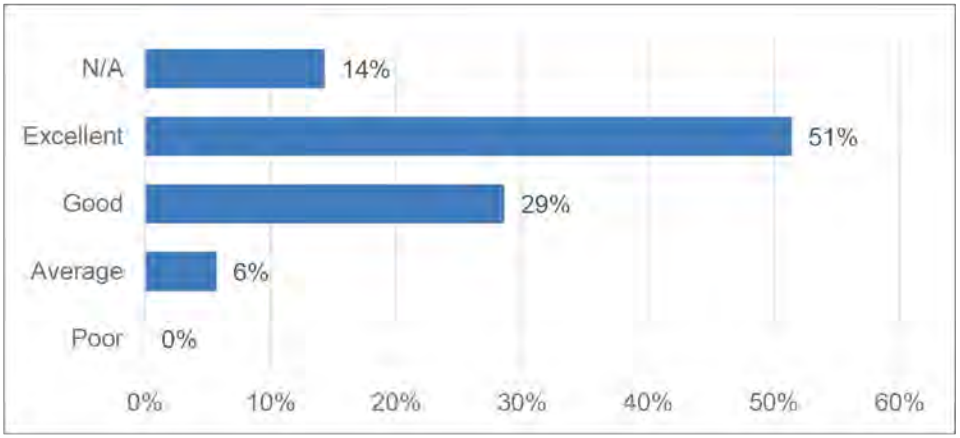
The ME is instrumental in identifying both research and development collaborators and creating partnerships for the PIs. In fact, 80 percent of the online survey respondents consider the ME's effectiveness in establishing partnerships "excellent," and 17 percent consider it "good." The ME shares information about MRA research activities internally, and the researchers share the same information by drafting trip reports. The annual research retreat provides a summary of progress for each MRA; some PIs expressed the need for more discussion time at the retreat. One in-country plant breeder expressed the desire for more interaction with researchers from other disciplines. The program director was

praised for his ability to work across disciplines. One of the PIs suggested that the communications director develop an online repository for information on MRAs so that PIs can easily locate information relating to other MRAs. This would allow them to see what is happening and assess opportunities for collaboration and cross-pollination among researchers.

A range of training activities takes place within the MRAs including developing the curriculum of training capacity. Curriculums developed include the Master of Science curriculum at West Africa Center for Crop Improvement (WACCI), the training-of-trainers (ToT) programs developed and conducted by SIL PIs and partners]; PhD and Masters training; short courses such as at the Africa Plant Breeders Academy in Nairobi, Kenya; training sessions and seminars implemented directly by SIL staff; and on-the-job capacity development for numerous individuals associated with SIL (these include webinars, working with PIs in field, interactions among partners, attending events and conferences, and others). The different MRAs have different approaches to training, as described in Section 4.6. The ET interviewed four PhD and MA students who all joined SIL voluntarily, not through planned, advertised studentships, and all were contributing significant inputs to the overall research program.

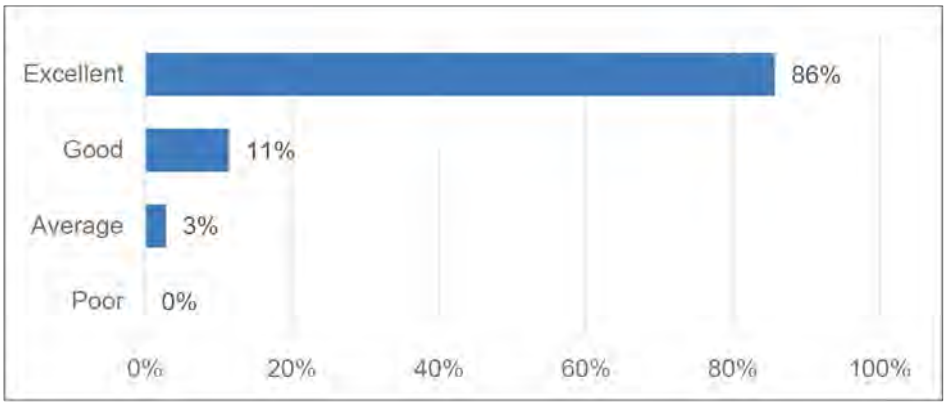
According to the online survey, 51 percent of those surveyed rated SIL ME's effectiveness in implementing and managing the above training activities as "excellent," and 29 percent rated it as "good" (see Chart 1).

Chart 1: Rate the Effectiveness of the SIL ME in Implementing and Managing SIL's Training Activities



The original project design did not include a Communications Director; however, the ME was quick to realize the importance of disseminating research results and R4D products to SIL target audiences, and was able to persuade the PIs to support adding a communications director position. The selected candidate took a proactive role in disseminating the outputs/products generated by SIL. The availability of R4D "products" provides something tangible and useful that SIL can disseminate to development partners (see Annex 6). All SIL team members (particularly the ME) are involved in dissemination activities, which include one-on-one meetings, formal and informal presentations, and the Kick-Off and Soy Food Bazaar. Information is also disseminated via SIL's own website, webinars, monthly newsletter, weekly digests, fact sheets, videos, and partner websites and publications. Eighty-six percent of people the ET surveyed saw the ME's effectiveness in information dissemination as "excellent." (see Chart 2).

Chart 2: Rate the Effectiveness of the SIL ME in Disseminating Information Regarding SIL Activities to Stakeholders



4.1.2 Conclusions

The ME is very effective in implementing and managing the SIL Program.

Both the Agreement Officer's Representative (AOR) and ME had to exert considerable effort to deal with and smooth over USAID's delayed funding disbursement, which also negatively impacts SIL's Program efficiency and its relationships with some partners.

The management of research and training are both decentralized to the MRA PIs. The R4D pillars and the MRAs are broadly structured on disciplinary distinctions, and the PIs have considerable autonomy in designing their MRAs. PIs desire for more cross MRA interaction and information-sharing to avoid a "silo-effect." The program Director's ability to translate across disciplines will be essential in facilitating research integration, particularly since some PIs may lack experience in integrated R4D.

SIL's overall approach to training is considered to be appropriate to an R4D program. Different MRAs have different training methods, and gains can be made by learning from each other. This positive effect of cross-pollination is further elaborated in Section 4.6. PhD and MS training has been opportunistic, not necessarily planned from the start, yet the ET interviewed graduate students who all have important roles to play in contributing to SIL's overall research program. Therefore, the uptake of research results by development partners can be prioritized over simply using the research process as a training opportunity for postgraduate students.

There is the opportunity to focus dissemination activities around SIL's R4D products and for the communications director to work with PIs to identify and generate a range of communications outputs targeting the different audiences associated with each product.

4.1.3 Recommendations

Recommendations have been prioritized as either high (HP), medium (MP) or low priority (LP). Some recommendations overlap with, or are linked to, others presented in other sections; such linkages are indicated with a reference to the other section.

[HP] Where appropriate, the ME should foster **greater consistency of the overall research program, and greater integration across MRAs**. This can be achieved through, for example:

- The program director taking a more proactive role in MRA research design, as required, to achieve overall program consistency and to facilitate greater MRA integration;
- More discussion at annual research meetings (e.g., after MRA presentations, other PIs should be thinking of how they can link into/enhance other MRAs);
- All-PI planning meetings to identify linkages and areas of potential integration;

- Capacity development by the gender and environment PIs to help other PIs understand better how to integrate gender and environment into their MRAs;
- Joint-PI planning for the development of R4D products that require an integrated research approach; and
- Increased awareness among PIs about each other's work and approaches. This can be achieved through an internal repository of information or by planning overlapping field trips so that time can be spent in country observing other PI activities and interacting informally.

[HP] The ME should ensure that **appropriate R4D products and associated dissemination outputs** are identified and planned from the start, and that there is a clear understanding of responsibilities for both MRA PIs and the communication director in how these products and outputs will be disseminated.

[MP] The ME should facilitate **sharing of the different MRAs' experiences and lessons from training and capacity development** so that the PIs can determine which approaches are most successful and lead to greatest impact (see Section 4.6.3).

4.2 EQ 1.2: PROGRAM MANAGEMENT – HOW EFFECTIVELY DID THE ME COMMUNICATE AND COORDINATE WITH USAID/BFS, USAID MISSIONS, PARTNERS, HOST COUNTRY GOVERNMENT PARTNERS, LOCAL RESEARCHERS, AND OTHER STAKEHOLDERS AS A WAY TO: BETTER ACHIEVE PROJECT GOALS AND OBJECTIVES; CREATE AND CARRY OUT A SHARED RESEARCH AGENDA; IMPROVE THE CAPACITY OF LOCAL RESEARCHERS; AND IMPROVE DISSEMINATION?

4.2.1 Findings

The ME's means of communication with USAID, partners, and other stakeholders include face-to-face meetings and site visits, remote meetings and discussions (by telephone, Skype, WhatsApp, etc.), email, the SIL Weekly Digest, and the SIL Monthly Newsletter, as well as the videos, fact sheets, and webinars that are available on the SIL website. There is also a monthly GoToMeeting web conference for PIs as well as graduate students, interns, and other collaborators. Comments made by KIs to describe the ME's communication and coordination style included feedback that the ME is very active; is good at getting people engaged; is always in touch; regularly gets out to visit; takes part in our events; is very good at communicating, and is outstanding. Online survey respondents rated ME's effectiveness in communication and coordination very high 77 percent said it was "excellent," and 20 percent said it was "good."

Coordination with partners is achieved through sub-award agreements and associated Scopes of Work (SOWs), budgets and budget justifications. Sub-award agreements clearly outline the overall objective and purpose of the partnership as well as the scope of engagement relating to a shared research agenda and capacity development of local researchers.[13] The SOWs contain clear objectives, activities, and deliverables. The development of the agreements is very collaborative and involves substantial detailed prior discussion by SIL and the partner. The partner then drafts the initial SOW, budget, and budget justification for subsequent review and input from SIL. The SIL's Associate Director reported that relatively few edits/negotiations are needed at this stage, suggesting the effectiveness of the prior communications between SIL and the partner.

[13] There are no sub-awards/contractual agreements with in-country partners that relate specifically to dissemination (of communications outputs); the bulk of dissemination is done by the SIL Communications Specialist in collaboration with MRA leads and the international partners.

Other coordination mechanisms include an annual work plan, produced in collaboration with local partners and stakeholders, that encompasses all MRA efforts. An annual travel plan is also developed. Both plans are shared with the AOR for review and approval. Additional communication mechanisms include the semi-annual and annual reports, which are approved by the AOR and shared with the Missions, usually with the pertinent information highlighted for each Mission. SIL's inputs to the Feed the Future Monitoring System is also accessible to both USAID HQ and USAID Missions.

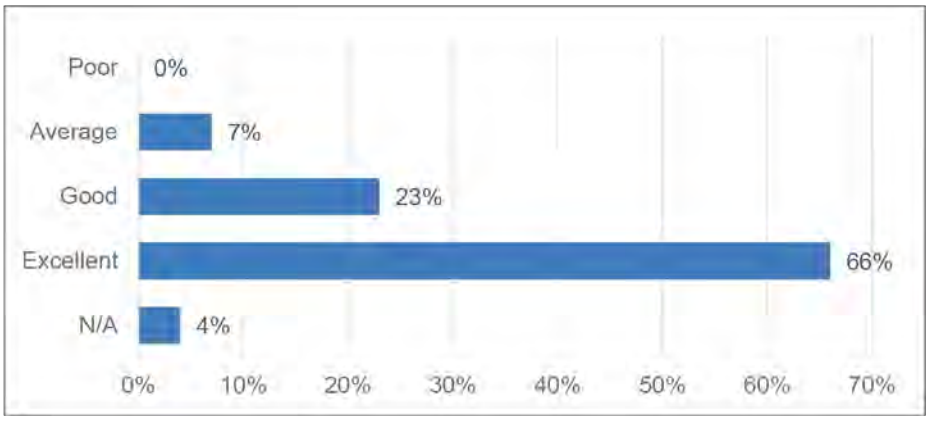
The ET found that there were only two negative comments on communication and coordination provided by the KIs. These had to do with the fact that the host country/host partner's Internet connection not always able to support effective participation in scheduled meetings and discussions; and the fact that some of the technical reports containing research results are not always shared by SIL with the host partner.

USAID staff interviewed at BFS and the Missions agreed that ME communication and coordination was excellent. Positive feedback included that the ME is the first to highlight any weaknesses to BFS and to find ways to address them; and the ME and PIs brief the Mission staff every time they visit the country (often inviting key in-country partners to these briefings) and are responsive to the linkage and coordination efforts made by USAID for USAID-funded projects. From the perspective of the ME, it has been a challenge to convince some of the Mission staff of the need for R4D-type research. Both the ME and USAID staff said that the timing of funding cycles affects the ability of USAID and USAID-funded projects to engage meaningfully with SIL. Accordingly, partnerships, activities, and support for SIL need to be incorporated into USAID Mission strategies and USAID-funded projects at the planning and design stages. Similarly, USAID Mission staff like to be consulted when new proposals funded by HQ are being developed.

Concerning project goals and objectives, the R4D approach is difficult for some development practitioners and researchers to understand. However, the ME successfully developed the language and terminology needed to communicate this issue effectively. For example, when talking to development partners, the ME refers to "science" and "evidence" as opposed to "research." The concept of R4D "products" was also developed to help convey how R4D can support the work of development practitioners. When talking to researchers, the concept of "small R for big D" is helpful in conveying SIL's R4D approach.

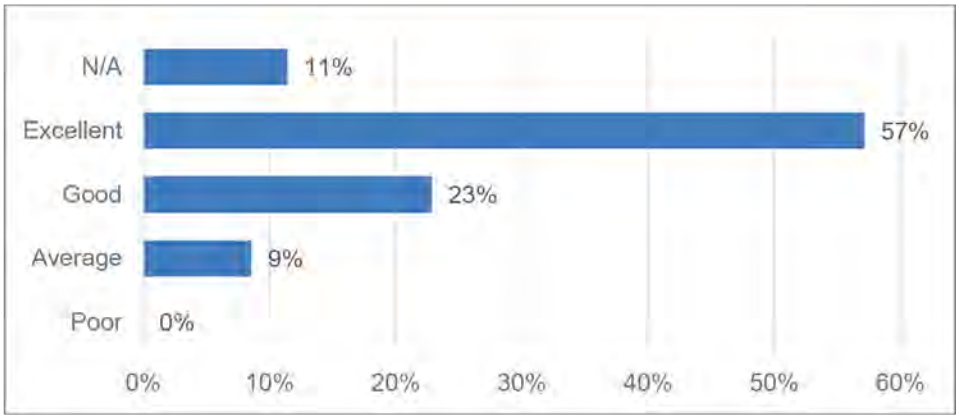
The language above helps the ME to create and carry out a shared research agenda, which is further supported by the ways PIs interact with the partner organizations and local researchers. The contracts described above provide a clear structure to these relationships, with clearly defined activities and deliverables to be undertaken by the partner. The SIL administration team and the PIs monitor the partner activities and deliverables. In the few cases where a partner is having difficulties in completing certain deliverables within a SOW, the partner communicates this with SIL and the PIs who then work with the partner to overcome obstacles and challenges to successfully deliver on the SOWs within the initial time frame or with a no-cost extension. According to the online survey, 66 percent of respondents rated the ME's effectiveness in communicating/coordinating to carry out a shared research agenda as "excellent" and 22.9 percent rated it as "good" (see Chart 3).

Chart 3: Rate the Effectiveness of the SIL ME in Communicating/Coordinating to Carry Out a Shared Research Agenda



Asked about ME's effectiveness to communicate and coordinate to improve capacity of local researchers, 57 percent rated it as "excellent" and 23 percent as "good" (see Chart 4).

Chart 4: Rate How Effective the SIL ME Was in Communicating/Coordinating to Improve Capacity of Local Researchers



Within the MRAs, an example of a shared research agenda is the case of the development of the Plant Breeding Masters course; the in-country partner conveyed a strong sense of ownership within the Innovation Lab structure.[14] Another example is provided by the partner National Agricultural Research System (NARS) plant breeders, who are responsible for designing and planning the breeding trials with support from the PI. The four local researchers interviewed all agreed that their capacity had been improved through their communications and interactions with the SIL team. One remarked that the ME was an effective enabler that had created opportunities or "opened doors" for him. Another mentioned that he/she had had the opportunity to present at a webinar for the first time and had also received information from SIL about scholarship opportunities. The three African soybean breeders involved with SIL all agreed that they would benefit from the opportunity to meet and interact with each other to share ideas, plans, and accomplishments. One of the PIs mentioned that they spent about 50 percent of their time in working to develop the capacity of local researchers, giving seminars, and delivering training for development partners, which was regarded as highly appropriate for an R4D project.

[14] The Innovation Labs are structured so that an American university provides the leadership and management, and the African institute is a partner. Funding for the African institute comes through the lead American university, so it is not an equal partnership.

In its interactions with partners and stakeholders, the ME actively draws attention to SIL's dissemination outputs at both international and national levels, and encourages the participation of partners in key meetings or events such as the Advisory Board meetings, the Kick-Off events, and the Soy Food Bazaars where they can present their work/outputs. After the start of the project, the ME recognized the need for a Communications Specialist to promote the dissemination of SIL outputs, received agreement from the PIs, and liaised with USAID/BFS for this to be approved.

4.2.2 Conclusions

To fully communicate and understand the notion of R4D requires extra effort on the part of the ME and the researchers/partners/stakeholders. The ME has successfully found ways to communicate SIL's R4D approach to others, although additional efforts may be needed to develop a greater understanding of R4D within USAID, and the respective role of USAID HQ and USAID Missions in R4D approaches and processes. The notion of "R4D products" is a good way of communicating what the R4D approach is about and provides something very tangible for discussions with and dissemination to development partners.

Information from the KIIs shows that the ME is extremely effective, not only in communication and coordination but also in building and maintaining good working relationships with in-country partners and stakeholders. The role of the PIs and other SIL team members is also important in maintaining these relationships, ensuring joint ownership, and building the capacity of local researchers and development partners, all of which take time and effort. Partner relationships are structured by clear, specific, and realistic contractual agreements and by the collaborative method of developing agreements, which supports a sense of ownership by the partners. The fact that SIL has not experienced any conflicts or misunderstandings with any of its partners, and that most partners fully deliver (if not over-deliver) on their SOWs, suggests that SIL's communication and coordination are very effective in achieving project goals and objectives through a shared research agenda.

Communication, coordination, and relationship building take considerable time and effort. An increased number of partnerships will require increased investments in time and effort for effective communication and coordination. The roles of PIs and others in building these relationships should also be recognized and supported by all concerned.[15]

Internet connectivity in some host countries/partner institutes is limited to the extent that it hampers effective communication and partners' participation in scheduled meetings. Follow up notes from meetings, and individual phone calls and emails can help partners to stay informed when they are unable to participate in meetings.

The SIL Program cycle timing is not aligned with the USAID Missions strategies and planning schedule, which is a critical element in establishing a relationship. As such, it was challenging for them to engage with USAID from the start. For example, SIL is a 5-year project already in its third or fourth year of implementation, and it is difficult, if not impossible, to develop joint activities with the Missions and other USAID-funded projects.

4.2.3 Recommendations

[HP] As the program expands to incorporate more partners, the **ME and PIs should ensure that sufficient time and effort continue to be allocated to communication and coordination** for a

[15] The way in which the EQ is phrased appears to imply that it is the sole responsibility of the ME to communicate and coordinate with USAID/BFS, USAID Missions, partners, host country government partners, local researchers, and other stakeholders.

shared research agenda, capacity development, and dissemination. It is likely that this will require additional staff time. See Section 4.9.3 for additional action points in this regard.

[HP] It is recommended that SIL produces a **short briefing paper describing its R4D approach**, and that this is presented and disseminated among USAID staff at HQ and the Missions, as well as USAID contractors, to develop a greater understanding of R4D within USAID and find ways to promote more effective buy-in from the Missions and USAID contractors.

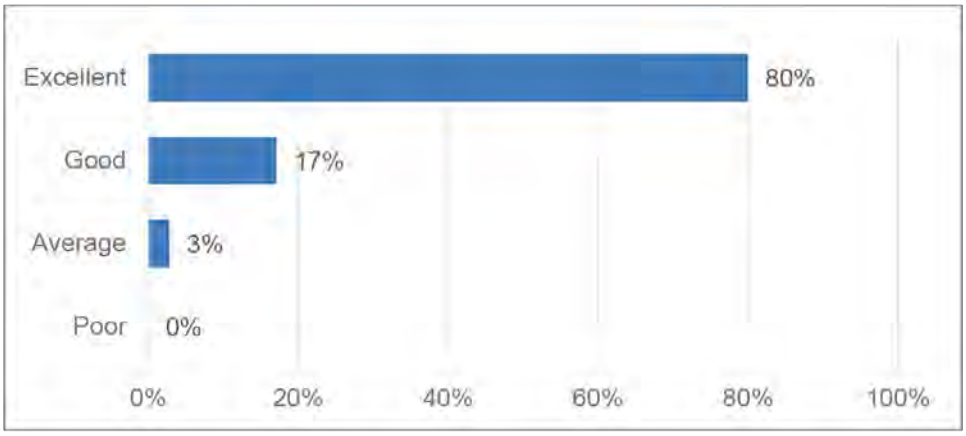
USAID Missions should be encouraged to promote collaborating, learning, and adapting (CLA) within their projects so that they can support R4D partnerships (see Section 4.8.3).

4.3 EQ 1.3: PROGRAM MANAGEMENT – TO WHAT EXTENT HAS THE ME BEEN EFFECTIVE IN ESTABLISHING PARTNERSHIPS WITH OTHER SECTORS (PRIVATE SECTOR, NGOS, USAID MISSIONS, ETC.) TO HELP ACHIEVE ITS TARGETS AND SUPPORT THE DISSEMINATION OF RESEARCH FINDINGS AS A WAY TO PROMOTE SUSTAINABLE PRODUCTION AND UTILIZATION OF SOYBEAN? WHAT OPPORTUNITIES ARE THERE TO EXPAND COLLABORATION WITH OTHER RELEVANT PARTNERS?

4.3.1 Findings

The ET conducted an online survey, which showed that 80 percent of respondents consider the ME's effectiveness in establishing partnerships as "excellent" and 17 percent as "good" (see Chart 5).

Chart 5: Rate the Effectiveness of the SIL ME in Establishing Partnerships with Other Partners



All but one of the partners, and most of the PIs identified the SIL program director as the main contact in establishing their partnerships under the SIL Program. They described the ME as being very active on the ground in developing relationships with partners. A stakeholder mapping exercise, undertaken in preparation for the Ethiopia Soy Foods Bazaar, identified several potential partners working at local and national levels. Annex 6 provides some examples of SIL partnerships with NGOs, the private sector, government organizations, universities, and international organizations and their roles in the SIL Program.

Both PIs and partners reported that once a new partnership has been established, it is the PIs that lead and coordinate the research and capacity-development activities in-country. As such, PIs are important in maintaining and building relationships with partners through in-country visits and coordination of programs.

The ME highlighted that NGO and project funding cycles are such that donor-funded programs are often unable to develop activities with SIL unless these have been incorporated into the project design at the start of a project.

Some existing partners highlighted the need to partner with other segments in the value chain, notably those commercial entities that will help create demand for soybeans and those involved in product marketing. For example, working with TechnoServe as an intermediary, SIL could gain access to commercial partners and more of the production value chain in Ethiopia.

Two NGO partners mentioned that research outputs are not necessarily packaged in a way that can be easily "digested" (understood or translated) and used by partners. Rather than detailed research reports and spreadsheets, these NGO development partners need extension-related outputs that can help them disseminate SIL's products to their clients.

4.3.2 Conclusions

The ME has been very proactive in effectively identifying and establishing linkages with a range of partner types (private sector, NGOs, government organizations, universities, USAID Missions, etc.). The Food Bazaar event approach provides a good entry point to working in country and developing partnerships. The PIs have not been as active in finding new partners, but they play an important role in maintaining and building established partnerships created by the ME.

The value chain approach taken to date has focused mainly on partnerships with those promoting soybean production and small-scale processing. A more comprehensive value chain focus requires expanding collaborations with partners involved in marketing to promote market linkages along the value chain.

Some research findings are not necessarily packaged in a way that development partners can make use of them in promoting soybean cultivation by farmers. Because of the lack of extension-type outputs, development partners may find it difficult to filter down information to extension agents, lead farmers, or farming communities.

4.3.3 Recommendations

[HP] SIL should ensure that research findings are presented and packaged in a way that they can easily be used by partners to promote sustainable production and utilization of soybean. (See Section 4.5.3 for further details.) SIL should develop a range of standardized communications products customized for each of the different types of partner/stakeholders—research reports for research partners, extension factsheets for development practitioners, short policy briefing papers for policymakers, etc.

[MP] The ME should continue to seek, identify, and establish new types of partnerships while waiting for existing partnerships to come to fruition. For example:

New partnerships should be expanded to include greater focus on market linkages (for input markets, soybean grain markets, and markets for soy food products) as well as partnerships with value chain actors further downstream in the chain, i.e., those who create demand for soybeans.

- Where appropriate, the ME should work with selected partners to facilitate the emergence of an innovation platform[16]to allow value chain actors and stakeholders to interact and develop and

[16] An innovation platform is "a space for learning and change. It is a group of individuals (who often represent organizations) with different backgrounds and interests: farmers, traders, food processors, researchers, government officials etc. The members come together to diagnose problems, identify opportunities and find ways to achieve their goals. They may design and implement activities as a platform, or coordinate activities by individual members" (S. Homann-Kee Tui et al.,.*Innovation platforms practice brief 1*, November 2013. ILRI). Additional references that document experiences with innovation platforms include: Gildemacher, P. and Mur, R. (2012). *Bringing new ideas into practice: experiments with agricultural innovation. Learning from Research. Into Use in Africa*. KIT Publishers, Amsterdam; and A.A. Adekunle and A.O. Fatunbi (2012). "Approaches for Setting-up Multi-Stakeholder Platforms for Agricultural Research and Development," *World Applied Sciences Journal 16* (7): 981-988.

test solutions to self-identified challenges. SIL's researchers should support this as innovation brokers and technical experts.

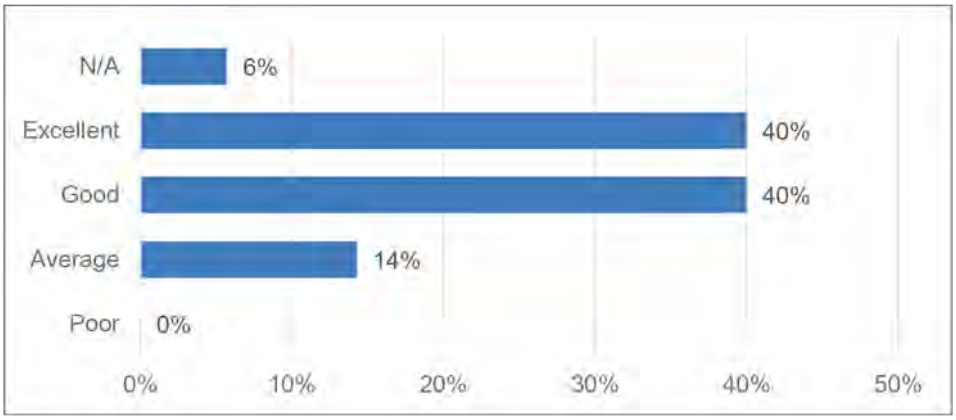
- Other relevant partners might include service-type partners (or sub-contractors), such as those who specialize in the facilitation of innovation platforms; those who can work with SIL's researchers in the development of training courses and materials; and in-country social media public relation companies who can promote dissemination of information to appropriate audiences.

4.4 EQ 2.1: RESEARCH AND TRAINING PROGRAM: TO WHAT EXTENT DID THE SIL GENERATE QUALITY RESEARCH TECHNOLOGIES/OUTPUTS USING APPROPRIATE METRICS (E.G., PEER REVIEWED PUBLICATIONS)? ARE THE OUTPUTS RELEVANT AND APPROPRIATE FOR A DEMAND-DRIVEN R4D PROJECT (E.G., DID THEY GENERATE/DEVELOP NEW TECHNOLOGIES OF RELEVANCE TO FEED THE FUTURE COUNTRIES THAT PRACTITIONERS AND/OR SMALL-HOLDER FARMERS ARE LIKELY TO USE)? WHAT OPPORTUNITIES ARE THERE TO IMPROVE RESEARCH OUTPUTS (IN TERMS OF BOTH INCREASING QUALITY AND GENERATING APPROPRIATE OUTPUTS FOR FEED THE FUTURE COUNTRIES) MOVING FORWARD? DESCRIBE AND HIGHLIGHT WHICH RESEARCH TECHNOLOGIES HAVE HAD THE GREATEST IMPACT OR POTENTIAL FOR THE GREATEST IMPACT.

4.4.1 Findings

According to the online survey, 40 percent of respondents rated SIL as highly effective in generating quality research products, while 40 percent rated it as effective (see Chart 6).

Chart 6: How Effective was SIL in Generating Quality Research Products?



The SIL Program defines its outputs as R4D products. The product concept originated out of conversations with development practitioners and the need to be able to explain what SIL Program could offer to support their development programs. Products are primarily evidence-based technologies[17]or "solutions" that are ready to be implemented at scale (Box 2). The SIL Program currently lists 23 R4D products on its website, including training programs (e.g., the Plant Breeding master's degree and training courses in soy processing and utilization and pesticide management and safety) and agricultural technologies (e.g., high-yielding varieties, inoculum, small-scale mechanization), as well as a network, a platform, a database, and a guide, among others. The full list of SIL's R4D products

[17] In this report, the ET uses the term "technologies" to refer to a range of research outputs, including methodologies and models, as well as agronomic practices and technical inputs such as improved varieties, threshers, and soil additives.

is presented in Annex 7. The ET assessed 18 of the 23 R4D products and associated outputs in relation to their likely use and potential for impact. The findings of this assessment are provided in Annex 6.

All 18 products reviewed had been or were likely to be used or taken up by researchers,[18] practitioners, and/or policymakers; 11 were likely to be used or taken up by both farmers and consumers, and 13 were likely to be used or taken up by processors and/or entrepreneurs. Eight products were likely to be used or taken up by all three categories of users, including secondary beneficiaries (see below for examples). In nine cases, the product itself was defined as a training course or breeding program or lab, which could be implemented by a partner (the primary beneficiary) to provide training or varieties or services for the benefit of farmers and/or entrepreneurs (the secondary beneficiaries). In five cases, the product was a variety or mechanized tool or kit that was designed to be used by farmers and necessarily involved development partners in its promotion or distribution. In two cases, (the disease diagnostic guide and the recipe database), the product could potentially be used directly by different types of users. In the case of Empowering Women through Soybean Farming[19]and Smallholder Soybean Adoption, the user and/or the product itself were not immediately identifiable, although both were considered to be of potential use to researchers.

Five of the outputs were custom-made in cooperation with a specific partner (the Plant Breeding master's course was developed with WACCI; the environmental analytical testing lab with SARI; and the soy utilization training course with the AgDiv Project). These projects also involved the users themselves in its function (for instance, the Soy Food Entrepreneur Network). In such cases, the partners had already started to use or implement the products. In several other cases, the users have been closely involved in the development and testing of the product, including involving blacksmiths and fabricators the in thresher design; chefs in the development of soy food recipes; mothers and babies in the testing of soy-based weaning foods; and—in the case of southern Africa—IITA has been supporting participatory varietal selection with farmers as part of its soy breeding program.

The R4D products were also assessed in relation to their likely developmental impact. In thinking through potential impact pathways (the last column of the table in Annex 7), additional associated outputs or products were needed in almost all cases. Three types of additional outputs were identified 1) evidence or proof to show that the product is indeed viable, effective, and/or beneficial [e.g., cost-benefit analysis to show the viability of mechanized threshers or soil additives; sufficient testing across different locations to show the advantages of High Yielding Varieties (HYVs) or data from clinical trials to show the nutritional benefits of soy]; 2) extension information to be used by development practitioners in promoting best management practices; and 3) materials such as fact sheets that can be used to promote awareness of and help create demand for SIL's products and associated services among practitioners and policymakers.

In addition to the overall assessment of 18 R4D products, the ET undertook case studies of eight R4D products, as presented in Annex 8. Summaries of two of these case studies are presented in Box 1 (below) and Box 3 (Section 4.5.1). Key findings of relevance to EQ 2.1 that emerge from these case studies include the following:

- There appears to be no systematic feedback from product users to the research team, which would be useful for ensuring that research outputs are relevant and appropriate to the users. Feedback from the users provides the information needed to make any necessary adaptations to ensure that the outputs are taken up (Annexes 8.2 and 8.4).
- Various market gaps exist in the soybean value chain, e.g., the private sector supply of inputs such as phosphorus and inoculum (Annex 8.4) or consumers' demand for soy milk and willingness to pay the market price (Annex 8.3).

[18] In cases where the product was designed to be used by research partners (e.g., breeding methods), the link to development partners was implicit rather than explicit, given the time that it would take to generate outputs to be used in development.
[19] See Annex 7.1 for additional details.

Box 1. Soybean Success Kits

Soybean Success Kits contain 2.5 kilos of locally produced soybean seed, 2 kilos of fertilizer, and a bag of inoculant—as well as pictorial instructions printed on the bag to show how to inoculate, plant, and harvest. Also included in the kits is a small bag of sugar for making a sticky solution for use in mixing the seed and inoculant. As such, the kits are a complete package directed for soybean production, containing all needed inputs and educational training to grow soybeans for smallholder farmers. The kits offer a practical way to introduce farmers to the inputs needed for successful soybean cultivation, particularly since these inputs (improved seed, inoculum, phosphorus) are often not readily available in rural areas. The assumption is that as farmers begin to realize the value of these inputs, the demand for these inputs will increase, and private sector suppliers will begin to provide them.

In 2015 and 2016, SIL and its partners assembled and distributed 4,800 soybean success kits to farmers in Ghana and Mozambique, and these farmers were then later interviewed for the Soybean Uptake and Network Survey (SUNS). Farmers using the kits saw soybean yields more than double, from 1,000 Kg/ha to 2,300 Kg/ha. This demonstrates that with the correct inputs and training on appropriate agronomic practices, smallholder farmers can substantially increase their crop yields and, in turn, their income.

In 2017, Catholic Relief Services (CRS) received funding from the USAID Agricultural Technology Transfer (ATT) project to distribute Soybean Success Kits to additional farmers in northern Ghana. Rather than directly distributing all the contents of the kit to farmers, CRS substituted vouchers for some of the kit's components, presumably in an attempt to create linkages between the farmers and the private sector agro-dealers to whom farmers would submit the vouchers in exchange for the required inputs. Vouchers for soil testing were also provided. This modification in the distribution mechanism of the kits, however, was regarded by SIL as a mistake because the farmers did not directly receive the complete bundle of inputs necessary for successful soybean production; the NGO partners failed to fully understand the primary purpose of the kits in ensuring that farmers received all the necessary inputs for successful soybean production. While SIL recognizes the need to involve the private sector in the supply of the kits, a clear model for achieving this has not developed and tested with partners.

The experience of the Soybean Success Kits suggests that 1) more capacity development is needed among NGO partners for the take up and promotion of SIL's products; 2) SIL needs to develop a model that clearly lays out the role of the private sector in the distribution of the kits and how market linkages between farmers and private sector input dealers will be developed and sustained; and 3) the take up, promotion, and use of SIL products (by development partners and end-users) needs to be monitored through the collection and analysis of feedback data.

4.4.2 Conclusions

The SIL Program has generated a wide range of different outputs, and the concept of an R4D product is a useful way of presenting these outputs to development practitioners. Greater consistency is needed across the MRAs in the ways in which the R4D product concept is applied; see Box 2.

Box 2. Suggested Definition and Features of an R4D Product

Based on review and assessment of SIL's existing R4D products, an R4D product might be defined as a tangible research output or evidence-based "solution" that can be promoted, implemented, used, or taken up by a development partner for the benefit of female and male farmers, entrepreneurs, and/or consumers, either as a pilot (with associated data collection and analysis for monitoring purposes) or at scale. R4D products include a range of research outputs, including:

- Training courses that can be implemented by partners,, such as ToTs, and the provision of course curricula and associated training materials that partners can use to train development practitioners, farming households, and both female and male entrepreneurs;
- Methodologies—perhaps a methodology for development practitioners to use in designing and establishing on-farm demonstration plots to promote best management practices among female and male farmers;
- Models for multiplying and sustaining the supply of quality seed of improved varieties to female and male farmers that might be taken up by a partner such as the Association for a Green Revolution in Africa (AGRA). Implementation could be through the private sector or through public-private partnerships;
- Improved agronomic practices, e.g., best management practices relating to optimal plant spacing, inoculum, and fertilizer application which could be promoted by development practitioners for use by female and male farmers;
- Agricultural technologies, e.g., improved varieties that could be multiplied by private sector seed companies, promoted by development practitioners, supplied by agro-input dealers, and used by female and male farmers (according to the associated model for the multiplication and supply of quality seed);
- Databases and guides that compile or synthesize existing research, data, or information into a format that can be easily used by development practitioners;
- Networks, platforms, or associations (or a model for such bodies) that are facilitated by either the research partner or a development partner for the benefit of development practitioners, policymakers, farmers, entrepreneurs, and/or consumers.

R4D products must have clearly defined users. When designing research initiatives to develop R4D products, the researcher must ensure that the necessary partnerships are set up to make sure that the products are appropriate for user needs; the products do not have any adverse environmental impacts; the partners have the capacity needed to promote/take up/implement the products; the products will reach the intended users; and the users will have the necessary capacity to be able to use the products to their maximum potential. Various associated research outputs like cost-benefit analysis, gender analysis, and environmental impact assessment, and various communications outputs such as promotional materials and extension-related products will necessarily be required in this regard.

The findings presented in Annex 7 and summarized above show that 16 out of the 18 products reviewed were relevant and appropriate for a demand-driven R4D project in that they involved technologies/outputs that practitioners, farmers, or entrepreneurs were likely to use (as opposed to ones used only by researchers). At least four different types of product could be discerned to 1) those designed to be implemented by research partners for the benefit of development partners and others (e.g., environmental lab, breeding methods, masters course); 2) those designed to be implemented by development partners for the benefit of farmers and/or entrepreneurs (e.g., training courses); 3) those designed to be used by farmers, consumers, or entrepreneurs, and promoted by development partners (e.g., HYVs, weaning foods, mechanized thresher); and 4) those designed to be used by development partners, farmers, and/or entrepreneurs directly (e.g., network, guidelines, database).

The uptake of a product is most likely in cases where the user has been involved in its development process.

The articulation of development pathways (also known as impact pathways or theories of change) is a useful way of checking that a particular product has all the components or associated outputs necessary for its uptake and will lead to developmental impacts. In some cases, a single product may consist of a

bundle of associated outputs or resources. For example, the training course on household soy processing and utilization includes the course curriculum (adapted to the specific user's needs); an extension guide; instruction sheets; and promotional videos. This allows potential users some degree of flexibility in how they use or implement the product. Three types of associated outputs were identified to be necessary for the uptake and use of R4D "technology" products (i.e., not including training courses, guides, databases, or networks) 1) supporting evidence; 2) extension information; and 3) promotional material. These outputs already exist for some products but not necessarily all.

4.4.3 Recommendations

[HP] For efficient research design, effective dissemination, and successful uptake, **the R4D product concept should provide the starting point for research design and planning**. This involves the following:

- R4D products should be clearly articulated, each with a defined set of users or beneficiaries (both primary and secondary, where relevant).
- The research planning process should include the articulation of development pathways (also known as impact pathways)[20] to ensure that a particular product includes all the components necessary to ensure its uptake.
- Wherever possible, users should be involved in the development and/or testing of the product to ensure relevance and appropriateness.
- For "technology" products, the following associated outputs should be developed to support their successful uptake 1) evidence or proof to show that the product is indeed viable, effective, and/or beneficial; 2) extension information that can be used by development practitioners in promoting the product; and 3) promotional materials such as fact sheets that can be used to create awareness of and demand for products and associated services among practitioners and policymakers.[21]

[MP] As more of the R4D products are put into use by development partners, farmers, entrepreneurs, and consumers, it will be important for the SIL team to **systematically gather and analyze feedback from the users to ensure that the outputs are relevant and appropriate**. SIL's economists and social scientists are well-placed to help design methods and tools for the collection of feedback data, and to ensure that it provides the technical scientists with the information that they may need to determine any necessary adjustments to the products themselves.[22] When partnering with development practitioners to promote the dissemination of technology products, SIL should ensure that feedback data are collected, analyzed, and shared with the researchers so that any challenges can be addressed, and any innovative aspects that may have been developed by the technology users can be highlighted to support future dissemination efforts.

[HP] **More research and R4D outputs/products are needed to address the various gaps in market linkages for both input and output markets, as well as markets for soy food products.** Examples of R4D products relating to input markets might include alternative, sustainable

[20] A development pathway or impact pathway outlines "plausible pathways of how research outputs will contribute to development outcomes […], as well as which partnerships are needed to deliver on set outcomes. Outcomes refer to changes in knowledge, attitudes, skills and most importantly practices in next-users, the people who directly use research results and products. These can include policy-makers, development organizations or international research institutions. Next-users have the ability to create an environment that ensures impact reach end-users such as smallholder farmers" (https://ccafs.cgiar.org/impact-pathways-0#.WIdlgKhI9PY). See also Schuetz T., Förch W., Thornton P., Vasileiou I. (2017) Pathway to Impact: Supporting and Evaluating Enabling Environments for Research for Development. In: Uitto J., Puri J., van den Berg R. (eds) Evaluating Climate Change Action for Sustainable Development. Springer, Cham

[21] Many such fact sheets already exist and more are in development. Ideally, these fact sheets should contain the evidence to show that the product is viable, effective, and/or beneficial.

[22] See also Douthwaite, B.J., Keatinge, D.H., Park, J., 2001b. Why promising technologies fail: the neglected role of user innovation during adoption. Research Policy 30 (5), 819–836.

models through which the private sector (or public-private partnerships) can be supported to deliver quality seed, inoculum, and appropriate fertilizer to female and male farmers in remote rural areas; and sustainable models for thresher acquisition, ownership, maintenance, and use that allow female and male farmers in remote rural areas timely access to threshing services. Examples of R4D products relating to output markets might include models for linking female and male soybean producers and large-scale soybean processors like feed manufacturers, and oil producers for the sale/purchase of quality soybeans;[23] and models for profitable soy dairy businesses.[24]

- The SIL ME and researchers should consult with development partners to identify R4D products that address existing market linkage gaps for both inputs and outputs (such as those mentioned above, among others), and design the necessary research to develop and disseminate these products.

4.5 EQ 2.2: RESEARCH AND TRAINING PROGRAM – HOW EFFECTIVELY HAS SIL FOSTERED DISSEMINATION OF RESEARCH RESULTS TO LOCAL STAKEHOLDERS AT ALL LEVELS? IN WHAT WAYS COULD DISSEMINATION BE IMPROVED (BOTH CONTENT AND AUDIENCE) TO ENHANCE THE UPTAKE OF RESEARCH FINDINGS?

4.5.1 Findings

Seven KIs felt that the SIL's monthly newsletter and/or weekly digest were informative and provided suitable updates to stakeholders. Three KIs mentioned that the webinars are well done and timely and mentioned the recent five-part webinar series on mechanization as a good example. Other dissemination channels include fact sheets, videos, and short features in various other newsletters (e.g., AgriLinks, University newsletters, etc.), all of which are available on the SIL's website. A communications survey had been implemented by SIL to gather users' feedback on the different communication outputs, but unfortunately the response rate was low, and the results are not reported here. These findings suggest that SIL is effective in disseminating results at the program level and is good at using video-based communications products (i.e., webinars and videos).

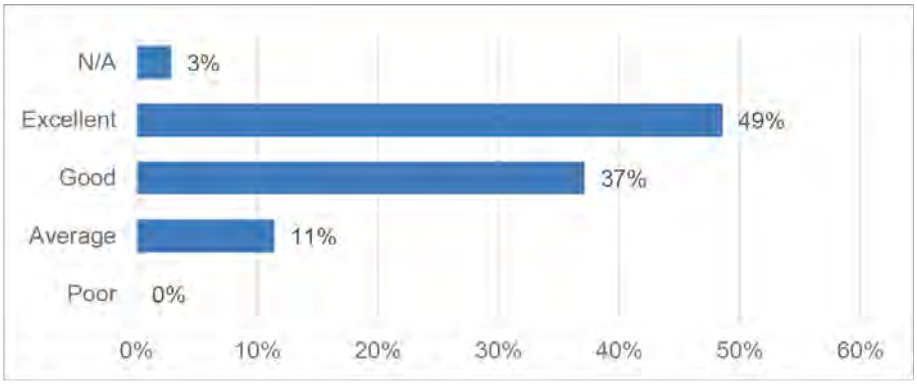
SIL also disseminates research results and products through annual in-country events, i.e., the Kick-Off Event and the Soy Food Bazaar. The six randomly selected participants interviewed at the Kick-Off Event provided the following anecdotal comments, "there were too many participants to allow for detailed knowledge sharing; smaller, mixed-group interactions (to maximize linkages and networking opportunities) would have been better"; "some of the presentations were not appropriate to some of the participants (especially those who did not speak English and had less education)." For example, one project employee suggested that some of the partner organizations had perhaps not sent the right representative (for instance a technical person as opposed to a manager), one farmer particularly liked the field tours, and one project manager felt that there was too much time spent on the field tours. In summary, one of the successes of the Kick-Off Event was attracting a large number of participants. However, this also presents the challenge of managing a large, varied group so that everyone feels that they have gained some useful and relevant knowledge in an enjoyable manner.

The participants at the Tamale Soy Food Bazaar clearly enjoyed the event, and the Chef's Competition sparked a lot of excitement. All six randomly selected participants interviewed reported that they learned about different soy food products during the event.

[23] Such linkages may involve aggregators and traders as intermediaries and/or the creation of soybean producer associations and/or the training of entrepreneurial community-based marketing agents or facilitators (as in the CRS model), among others.
[24] This would necessarily include guidance on the most appropriate type of individual to manage a dairy (i.e., the necessary skillset and experience); the various investments needed, not only for the production, packaging, and marketing of quality soy products, but also for the hygiene-related requirements needed to meet the necessary food quality standards, as well as detailed guidance on marketing and pricing for profitability.

All PIs agreed that dissemination and communication are crucial in R4D, and were appreciative of the proactive role taken by the communications director. Some MRA outputs/R4D products have been disseminated more effectively than others. This partly relates to the level of "completeness" of products as some are farther along in their development than others. For example, the Soybean Success Kits (Box 1) might be considered a "completed" product; kits have been distributed to 4,800 farmers in Ghana and Mozambique and information regarding their uptake was collected.[25] The dissemination of the kits has already transitioned from SIL to partner development NGOs (see Box 1 and Annex 7.4). By comparison, information collected at the SMART Farm (Box 3 and Annex 7.2) is providing preliminary data on the advantages of fertility and other supplements for increased soybean production. This vital knowledge has been shared with partners at kick-off events, but the data is still incomplete (due to the need for multi-year repeatable trials) and the preliminary information has not been packaged effectively for partner NGOs to disseminate to farmers and other interested parties. According to online survey results, when asked about the effectiveness of SIL in developing products that practitioners will use, 49 percent of respondents rated it as "excellent," 37 percent rated it as "good," and 11 percent as "average" (see Chart 7).

Chart 7: How Effective was SIL in Developing Products that Practitioners Will Use?



Overall, the evidence suggests that dissemination of research results at the MRA/product levels can be improved.

Box 3. The SMART Farm Approach

The SMART (**S**oybean **M**anagement with **A**ppropriate **R**esearch & **T**echnology) Farm is described as a "knowledge and technology hub, providing farmers, practitioners, agricultural development organizations, and governments with evidence-based technical guidance on soybean production." The SMART Farm serves both as an independent, unbiased research trial as well as a demonstration of best management practices. Although a number of so-called best-practice recommendations previously existed, these were undocumented, and SIL felt it was necessary to develop an evidence base.

The SMART Farm contains research plots for the evaluation of issues related to planting date, amendments including phosphorous and inoculum, planting methods and varietal performance. Partnerships with private sector companies such as Omya and BASF have allowed for agro-chemical products from these companies to be tested on the SMART Farm. Closer working relationships with other MRAs would similarly allow for SIL's own technology products to be tested and evaluated (particularly through cost-benefit analysis). On-station research has been undertaken over several seasons, and farmers and development partners alike are now keen to benefit from the results.

[25] It is not known whether this information was then used to modify the design of the kit in any way. What is interesting is that the kit was apparently altered by a development partner—whether this was unintentional or deliberate (to promote the development of commercial input markets) is not known—but this type of feedback is vital to ensure that the design is appropriate to the context and the users. See Annex 7.4 for further details.

In Ghana, the SMART Farm is hosted by SARI and has three farms on SARI research stations in the three northern regions of Ghana (Nyankpala, Wa, and Bawku). The SMART Farm concept has also recently been introduced into Ethiopia, where there is one on-station farm hosted by Jimma Agricultural Research Center (JARC). One of the lessons learned in Ghana is the need to involve a range of experts from the start; in Ethiopia, different subject-matter specialists—including a soil scientist and an economist—have been involved in setting up the trials. The SMART Farm provides an example of the need for interdisciplinary research, involving both natural scientists from different agricultural disciplines and also economists.

In both countries, the limited number of sites limits the potential for demonstration. Farmers, traders, development practitioners, private sector suppliers, donors, and other stakeholders are invited to tour the SMART Farm at the annual Kick-Off Event. The SMART Farm Manager has also reached out to train development practitioners and farmers, where possible. Technical guidance (in the form of training courses and extension materials) has, however, been limited to date due to the prior need to build up a body of evidence, as well as funding constraints, and the barring of extension activities from the initial SIL proposal.

One of the four development partners interviewed about their information needs in promoting soybean was very clear on what kind of information they needed and how it should be packaged and disseminated (as ToT curricula and courses in this case). The three other development partners interviewed were not, at first, able to articulate what type of information they needed or in what format they would prefer to receive it. Ideas relating to information needs and how this information should be packaged emerged quickly, however, after discussing and understanding: their extension methods/approaches; who is responsible for developing the technical content of their extension messaging; and how technical content can best be provided by SIL. Technical extension information sheets relating to specific aspects of soybean cultivation were requested, which could then be compiled into a compendium or extension manual. The technical information contained in these sheets could also be used as the basis for the production of extension videos, radio programs, etc., by the development partner (and the specialized communications companies that they contract for developing their extension tools). It was also suggested that the SMART Farm Manager should meet with the development project agronomist to ensure that their extension messaging is correct.

At the PI discussion, SIL PIs understood they should not be conducting extension activities with farmers because the SIL Program is intended to support development practitioners, and it is the development practitioners that are supposed to do the extension. Nevertheless, some of the activities undertaken by SIL can be regarded as extension. For example, the Soybean Disease Diagnostic Guide can be regarded as an extension guide. The SMART Farm serves both as a research trial as well as a demonstration to farmers of best management practices (Annex 7.2).

4.5.2 Conclusions

SIL is very effective in disseminating research results at the overall program level, though there is room for improvement in dissemination at the MRA and product levels. Weekly digests, monthly newsletters, and webinars are appreciated by those who receive and view them. The Kick-Off and Bazaar events are useful in showcasing SIL's breeding and SMART Farm activities as well as creating awareness about soy food products. There is potential for both events to be improved so that they are even more effective (according to the specific objectives that they aim to fulfill, which may vary in different contexts). For example:

- For the Kick-Off Event, more actors from different parts of the value chain could be invited and a portion of the program could involve small-group discussions of mixed participants to promote linkages between adjoining value chain nodes and greater understanding of the whole value chain. Also, more extension-type fact sheets based on information presented at the meeting could be made available to participants so that knowledge discussed at the meeting could be taken away and shared with others (i.e., lead farmers sharing information with their home communities).

- The "edutainment" approach of the Soy Food Bazaar also worked well. Participants enjoyed the event and learned about a range of soy food products. The Bazaar and the Chef's Competition provided good content for in-country social media messages that participants themselves could help disseminate to the general public and potential soy consumers. The event could also be used to attract new members to the Soy Foods Entrepreneur Network.

SMART Farm is allowing SIL to provide vital information to its partners about the advantages of fertility and other supplements for increased soybean production. However, KIs expressed concern that this information has not been disseminated effectively to farmers and other interested parties and suggested that dissemination of research results at the MRA/product levels has room for improvement.

Events such as Soy Food Bazaar were successful and provided opportunities to educate participants about soy food products and increase the Soy Foods Entrepreneur Network.

Useful lessons can be learned from different MRA/product experiences in dissemination of products and research results (see Annex 7 for examples). As Annexes 7.2 and 7.4 show, it is essential that information regarding the use and uptake of the products by farmers/entrepreneurs/processors is fed back to the researchers to ensure that the products are appropriate in different contexts and to highlight any changes or modifications that may be needed. Similarly, for research outputs and products where a development practitioner is a user or involved in its dissemination (e.g., technologies, training courses, extension-related information), it is important to gather feedback that can usefully inform any need for improvement (see Box 1).

4.5.3 Recommendations

[HP] Within an R4D approach, **dissemination should be regarded as part of the research process** to ensure that the product will reach the intended end users. Researchers should learn from what has worked well to date and work under the leadership of the communications director to develop a dissemination plan appropriate to their specific products:

- **Different types of communications products should be developed for different target audiences** associated with specific products, e.g. research reports for research audiences; technical extension factsheets for development practitioners (including agricultural extension staff); short policy briefing papers for policy-makers, etc.
- For products that take several years to "complete," communications outputs may need to be phased so that there are useful communications on progress, milestones or preliminary results for each year of implementation, rather than waiting until the product is completed. For example, annual briefs could be developed to create awareness among government seed agencies and private sector seed companies about new varieties under development.
- Communications outputs must include extension-related materials for products that are ready to be implemented and/or scaled up (see below).

[HP] **It is recommended that USAID funds extension programming** in any future SIL Program to move the project forward; lack of support for extension activities will result in SIL generating products that do not reach their intended audience at an acceptable level for sustained success. Extension involves a two-way flow of information; therefore, it is necessary for SIL to gather feedback on the use of its products (by development practitioners, farmers, and entrepreneurs) to ensure that the products are tailored and appropriate for different contexts and to make any necessary adjustments or improvements.

- For products that are ready to be implemented and/or scaled up by development practitioners and/or commercialized by entrepreneurs or the private sector, SIL must provide extension support (i.e., by providing the awareness, knowledge, and training necessary to development partners to ensure that the R4D products reach the farmers/processors/entrepreneurs) with appropriate feedback loops where possible.

- SIL should develop a clear approach for the provision of two-way extension support to development partners and this should be funded by USAID.
- SIL's communications outputs should include technical extension information sheets suitable for use by development practitioners, including agricultural extension staff.

[HP] The ET recommends that the **SMART Farm approach should systematically incorporate** 1) **a more MRA-inclusive, inter-disciplinary approach so that the SMART Farm provides a genuine "hub"** that encompasses a much broader range of SIL's research; 2) **ToT- type training to technical staff** of NGOs and donor-funded projects involved in promoting soybean cultivation, soil testing, and the safe use of pesticides; 3) disseminating research-based agronomic information in the form of technology fact sheets, a compendium of fact sheets, or an extension-type manual suitable for use by development partners, extension workers, and soybean farmer organizations; 4) disseminating policy-relevant briefings or fact sheets on the inputs necessary for soybean production (targeted at government decision-makers and private sector input importers and distributors as well as NGOs and civil society organizations involved in advocacy for policy reform in the agricultural sector); and 5) working in partnership with NGOs and development projects that are promoting soybeans to train staff in the design of on-farm demo plots, potentially using a mother-baby approach in which the "mother" plot is an on-station SMART Farm which is used as a training location/demo plot for a series of on-farm "baby" plots managed by the NGO/project extension agents. Having **an extension component** would enhance the SMART Farm's ability to provide recommendations to the target audiences.

[MP] The Soy Food Bazaar approach could be further developed and promoted as a SIL product that development practitioners can themselves implement to promote awareness about soy foods.

[HP] Provided that they have a good understanding of how their products can potentially reach the end users to achieve sustainable development impacts,[26] the PIs themselves ought to be aware of the target audiences for any necessary awareness-raising, knowledge-creation, and training (see Section 4.4.3). They need to then work with the Communications Director to design the most **appropriate dissemination outputs for the target audiences**[27] for their specific products (see also Section 4.3.3). Research outputs/products and their dissemination are more easily accomplished and with greater efficiency when PIs are aware of what is needed by practitioners. This knowledge can be gained through discussions by SIL with development practitioners to determine what extension methods/materials would be effective to promote a particular SIL product. The lack of a role for extension activities within SIL needs to be addressed in future SIL programming to support practitioners' extension efforts to ensure effective promotion and sustainability of SIL products (see above).

4.6 EQ 2.3: RESEARCH AND TRAINING PROGRAM: HOW WELL HAS THE PROGRAM IDENTIFIED AND ADDRESSED ACADEMIC AND TECHNICAL CAPACITY NEEDS OF HOST COUNTRY STAKEHOLDERS? HOW COULD THE PROJECT BETTER SERVE AND PROVIDE FOR THE CAPACITY NEEDS OF THESE STAKEHOLDERS?

4.6.1 Findings

Academic capacity development has taken place through:

1. *The development of the Plant Breeding Masters course*. Academic needs were identified jointly by SIL and WACCI staff and the curricula were developed accordingly. Particular attention was given to the need for training in statistical analysis.

[26] A clearly-articulated impact pathway or development pathway for a particular product would be useful in this respect.
[27] Target audiences might include policymakers and government decision-makers, as in the case of the need to make phosphorus available to farmers in Northern Ghana (see Annex 7.2).

2. *Internships where students from WACCI go to the University of Illinois, Monsanto, and/or Dow AgroScience to learn from professional plant breeders.* This was purposely developed to give WACCI students the necessary practical experience to prepare them for applied plant breeding work. In 2017, there were five interns from WACCI that visited the University of Illinois campus and Monsanto breeding and seed production facilities in Illinois and Missouri.
3. *Masters and PhD courses and/or fieldwork opportunities for students enrolled in American and African universities.* This has been opportunistic rather than planned according to identified needs, i.e., all the students interviewed used their own initiative to become involved with SIL. In the case of the students enrolled in African universities, it was the initiative of SIL's in-country researchers that allowed students to be involved. In the case of one SARI researcher, 10 graduate and undergraduate students were involved in the SIL research undertaken by the SARI researchers, allowing them practical experience in data collection and applied research, some of which contributed to their individual student dissertations.

Technical capacity development focused on:

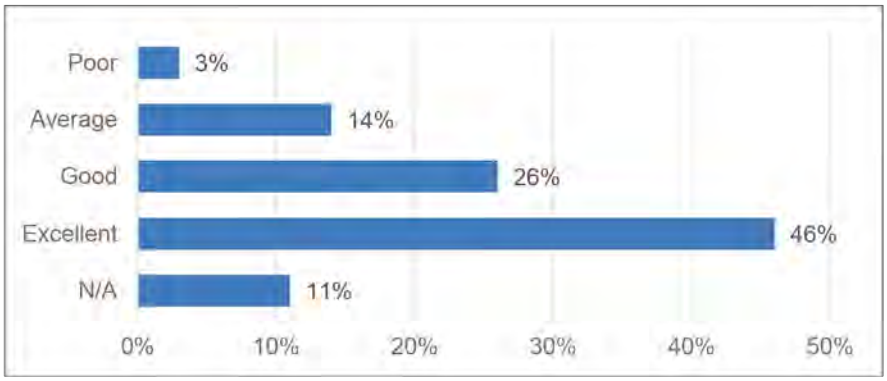
1. Addressing the needs of individual breeders and their technicians in the application of breeding methods, including cross-pollination and equipment needs.
2. Training technicians at the Environmental Analytic lab to be able to accurately test water samples for E. coli. Specific attention was given to the importance of precision and technicians highlighted the need for additional training in the maintenance of the equipment supplied to prevent malfunctions.
3. Training technicians and farmers on the safe use of pesticides.
4. Training Soy Dairy Network members in the use of Soy Cows, packaging, and marketing.
5. Involving thresher manufacturers/blacksmiths from local communities in designing and manufacturing the threshers and providing training for other blacksmiths in thresher construction.
6. Training development practitioners promoting nutrition in the nutritional benefits of soy and household-level processing for nutritious soy-based recipes (the ToT course was co-designed with the development project staff).

More informal technical capacity development has taken place through 1) working interactions among team members via regular PI site visits that provided one-on-one coaching, with regular follow-ups and support by email and Skype; and 2) one-on-one meetings between SIL team members and development practitioners that allowed development practitioners to better understand technical aspects of soybean production, processing, and utilization. In-country breeders from partner research institutes requested opportunities for further interactions and site visits so that they could learn from each other. PIs also had the opportunity to learn successful training and coaching approaches from each other.

It was apparent that capacity development of key individuals from in-country partners varied according to the individual's technical ability, enthusiasm for the work, and institutional support. In one case, an individual who participated in a short training course subsequently trained others in their organization. There is a risk that the more able individuals might be overloaded with responsibilities. On the other hand, SIL has provided additional support and oversight in cases where individuals have less ability, enthusiasm, or institutional support.

According to the online survey conducted by the ET, 46 percent of respondents stated that SIL has identified and addressed capacity needs of host stakeholders very well, while 3 percent stated that the program had done a poor job (see Chart 8).

Chart 8: How Well Has the Program Identified and Addressed Capacity Needs of Host Stakeholders?



Several partners requested more training including:

- CRS would like more guidance in ways to promote SIL's products among farmers as assimilation from the Kick-Off Event alone is not enough;
- JARC and SARI would like more training for technicians based in the field and sub-stations in key areas including, soybean pollination technique and hybrid pod harvesting; best practices for machine threshing of single plants, bundles and plots; rapid seed counting, seed packaging, and proper identification of seed packets for planting and harvest; how to avoid contamination/mixing of seed samples at every stage of seed handling; and appropriate tissue sampling technique for DNA marker analysis.
- Analytics Lab requested more training for lab technicians, particularly in the maintenance of equipment to prevent malfunctions.

4.6.2 Conclusions

The tendency is for capacity needs to be identified by the PIs through their experiences in working with particular partners/individuals. In some cases, needs were jointly identified with the partner. The appropriateness of the training will be greatest where the needs have been identified in collaboration with the partners/users, and where the users/students have taken the initiative to become involved.

Academic capacity development (in terms of degree courses) is not a key component of SIL's R4D approach, nor is it targeted to the sustainability of soybeans in SSA. Despite this, it is encouraging to see that SIL has been able to accommodate students into its research program, both formally (where students' research contributes to the SIL Program) and informally (where students are able to gain experience through fieldwork or other practical opportunities). Based on this, SIL has been successful in enhancing the capacity of students despite the fact that this is not a core component of its approach.

Potential for impact of capacity development varies according to individuals and institutions. Educational workshops/short-courses for research staff and/or graduate students conducted in country or in the U.S. help support the technical capacity of an institution.

With the exception of nutritional capacity development, technical capacity development has focused on research partners as opposed to development partners. There is a need for technical capacity development for practitioners responsible for promoting adoption and production of soybean among farmers.

4.6.3 Recommendations

[HP] **Trainings for development practitioners** in promoting soybean production should be developed and tailored to the requirements of specific partners:

- On-farm, field-based ToT curricula for soybean production and processing should be developed with the aim of 1) helping to promote the adoption of relevant SIL products and best management practices; 2) training NGO technical staff; 3) training extension workers; and 4) training lead farmers. The ToT curricula could be combined with user-friendly extension material (see also Section 4.5.3 on extension)

[MP] Key **individuals and key partner organizations targeted for substantial capacity development should be carefully selected and vetted** by the SIL ME and PIs. This can be done by:

- An organizational audit of potential new partners so that SIL is aware of specific capacity development needs from the start. This is a common practice among grant-making bodies and checklists are available for this purpose. Informal references for potential new partners might be sought from other organizations that may have previously partnered with and/or awarded grants to the partner in question.
- Vetting individuals according to criteria such as institutional responsibilities and the amount of time available for SIL activities; their track-record in terms of academic and/or professional performance; and their level of interest and enthusiasm for soybean research. Vetting can be done through consultations with their institutional supervisor/director and the individual's own referees; informal references from others familiar with the individual; assessment of the individual's ongoing work (t annual work plans, reports, and outputs); and a formal interview with the individual concerned.

[MP] Training needs to be explicit, engaging, and appropriate to the participants—one cannot assume that the target audience is learning everything just because they are attending the training. To ensure that the **quality of the training and training courses** provided by SIL remains consistently high, the ET recommends that SIL maintains an ongoing partnership with the implementing organizations or donor-funded projects that deliver SIL training courses.

- For the Plant Breeding Masters course, this might be achieved through maintaining a continued institutional link with WACCI through joint research projects and/or staff/student exchanges and internships.
- For short courses, such as those based on Training of Trainers courses, this might involve continued collaboration on longer-term R4D activities.

[MP] SIL also needs to ensure that the PIs themselves have the necessary **capacity to design and implement effective training**:

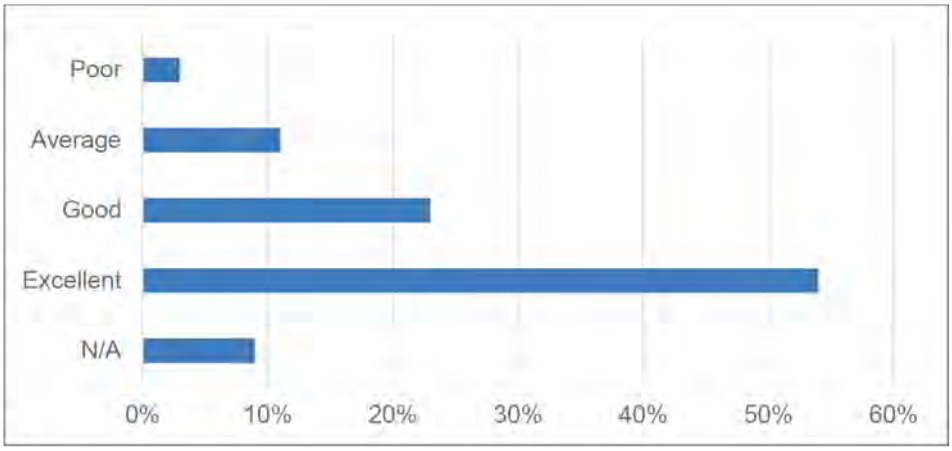
- SIL might consider facilitating an exchange of training experiences among the PIs so that PIs can learn successful training techniques from each other (e.g., ToTs). Where necessary, SIL should contract specialist trainers or training organizations to work with PIs to develop specific training tools and approaches (see Section 4.1.3 and also 4.3.3 on partnerships)

4.7 EQ 2.4: RESEARCH AND TRAINING PROGRAM – HOW PROACTIVE WAS THE ME IN RESPONDING TO RESEARCH CHALLENGES AND EXPANDING BEYOND THE SCOPE OF THE ORIGINAL PROPOSAL?

4.7.1 Findings

One of the overriding research challenges for the ME has been in implementing an R4D approach appropriate a lack of flexible funding and to the situation on the ground. R4D represents a significant change from conventional research approaches and can be a challenge for researchers to understand, design, and implement. The ME pre-empted this challenge when assembling the SIL team by taking the time to ensure that each individual PI was prepared to forego the desire to write refereed publications and, instead, use SIL funding to focus on the generation of R4D products. The ME pivoted away from processes and pushed the PIs towards developing products. The ME identified in-country collaborators for the PIs, and mentored individuals to be active in the field to ensure success. One PI had to be replaced by the ME for lack of progress. According to the online survey, 54 percent of respondents believe that SIL was very proactive in responding to research challenges and expanding beyond the scope of original proposal (see Chart 9).

Chart 9: How Proactive was SIL in Responding to Research Challenges and Expanding Beyond Scope of Original Proposal



The majority of PIs explained that the research they are actually doing is quite different from what had been planned in the original SIL-USAID proposal. It was only after they visited in the country for the first time that they realized what was needed and re-oriented their plans and activities to reflect this reality. An example is the mechanization activity, which became a major focus of the project well after SIL started. In this respect, SIL has overcome a major research challenge by re-orienting the program so that it is more relevant to the situation on the ground and the needs of the partners.

This reorientation of program activities was successfully implemented despite a lack of discretionary funds in the SIL budget. The lack of flexibility in the budget made it difficult for SIL to support new activities such as mechanization (in the form of things like threshers and tractors) suggested by partners in country. Nevertheless, through its close relationships with partners, the ME has been able to re-allocate and source small amounts of funds to help support specific activities in country. One example was re-allocating SIL's funds for CRS to support research on weaning foods as part of the nutrition program. Interaction of ME with local partners shows the flexibility within SIL to meet goals. However, not all attempts to source small amounts of funding have been successful; in the case of the Soy Cow at SARI (an activity under the Soy Food Entrepreneur Network), the amount of $4,000 could not be found to renovate the Soy Cow housing structure to make it compliant with the hygiene requirements of the Ghana Food and Drug Agency.

The ME itself has been disappointed by the apparent lack of associated funding available in country through USAID Missions, but has nevertheless persisted in writing funding proposals that have been submitted to a range of donors, with a roughly 50 percent success rate (calculated in terms of the number of proposals, not the financial value of the proposal budgets). An additional $1.7 million has been raised by SIL, including almost 50 percent from the USAID Mission in Ghana (mainly for applied research scholarships for WACCI plant breeders[28]), and just over 20 percent from USAID-funded contractors (mainly the AgDiv Project in Malawi).

The lack of discretionary funds has limited SIL's ability to react efficiently to the situation on the ground and to take advantage of opportunities as they arise. However, the case of Ethiopia provides an example where SIL has been more successful due to the overall functionality of the research partner, the energy and capacity of the individual researcher, and active support from development partners, including additional in-country funding. SIL started in Ethiopia in 2014 by trying to build the capacity of the breeding program at JARC-EIAR in Jimma. SIL expanded its footprint in 2017 by adding the SMART Farm and Nutritional program to its Ethiopian portfolio. The ME realized that this was a very positive collaborative relationship with EIAR, and that there was a stable environment in Ethiopia for SIL to grow. SIL has expanded beyond the scope of the original project by interacting with TechnoServe of Ethiopia in an effort to scale up soybean research and the production value chain. The ME also expanded SIL activities in Ethiopia by holding Soy Foods Bazaar and Soybean Kick-Off Event in country (with funding from USDA).

4.7.2 Conclusions

A lesson relevant to other R4D projects is the importance of understanding the in-country context of development and on-the-ground realities prior to designing an R4D program. For those lead PIs responsible for program design who are not already familiar with the target countries/regions and/or the potential development partners, then an in-country field visit and/or detailed discussions with the proposed partners are considered essential.

ME has shown initiative and imagination to go beyond the scope of the project and overcome research and funding challenges:

- PIs evolved with the project by adjusting MRA plans to meet the needs encountered on the ground to ensure the research is appropriate.
- The ME did what they could with an inflexible budget. There is need for greater financial flexibility to meet unexpected demands and take advantage of unplanned opportunities.
- By pivoting towards developing products, SIL researchers have been able to compete more successfully in winning additional funding.

4.7.3 Recommendations

[HP] Any future SIL budget should include flexible funds for multiple purposes, including:

- Funds for CLA that allow SIL to address the needs of its partners and support partner learning processes.
- Discretionary funds for use in situations where funds are required immediately for on-the-ground challenges or shortfalls faced by PIs or SIL's partners to meet SIL and USAID priorities.
- In-house competitive grant awards to PIs and/or partners. Selection criteria should include clear outputs of relevance to partners and cross-MRA research integration.

[28] Reported in SIL's semi-annual report for October 2016-March 2017.

4.8 EQ 3.1: INSTITUTIONAL COLLABORATION – HOW HAS THE ME PERFORMED IN ESTABLISHING PRODUCTIVE COLLABORATIONS WITH HOST COUNTRY GOVERNMENTAL AND ACADEMIC INSTITUTIONS, LOCAL NGOS, OTHER FEED THE FUTURE INNOVATION LABS, AND OTHER RELEVANT USAID PROGRAMS IN THE TARGET COUNTRIES? HOW COULD THE ME IMPROVE IN BUILDING ITS INSTITUTIONAL COLLABORATIONS AS A WAY TO SUPPORT INSTITUTIONAL CAPACITY BUILDING?

4.8.1 Findings

As noted in Section 4.2, the SIL ME and PIs have invested considerable time and effort in building genuine relationships with their partners. As a result of this, there are numerous examples of productive collaborations/linkages that have been established by the ME and PIs, including:

- Infrastructure, germplasm, and support to breeders at SARI and JARC—as well as IITA's trials in southern Africa—although results from JARC have been more successful than those from SARI;
- Connections between MRA 9, SARI, and CRS for the establishment of an environmental analytical lab;
- A relationship with TechnoServe of Ethiopia to develop a proposal for soybean value chain development in Ethiopia; and
- A connection between the Ethiopian soybean breeders and the Integrated Plant Breeders Program software technicians working for CGIAR (Gates-funded).

Further examples of collaborations include the following:

- The PI for MRA 4 received $120,000 from SIL funds for the WACCI course and matched that with $400,000 worth of funding obtained from multiple sources, including the USAID Mission in Ghana, AGRA, Mars Candy, Monsanto, and Dow AgroSciences.
- The AgDiv Project in Malawi has sub-contracted SIL to provide ToT on household processing and utilization, among other inputs.
- The Soy Foods Entrepreneur Network builds capacity by network members interacting with each other and finding solutions to their problems.

On the other hand, a partner meeting organized by the USAID Mission in Ethiopia provided an opportunity to establish links with other Innovation Labs and USAID-funded programs in country. A one-page "brochure" for SIL overall, and SIL in country, is a good way of promoting awareness of SIL in country so USAID contractors and other development agencies take advantage of the capacity development opportunities that SIL can offer through its R4D approach.

A stakeholder mapping exercise undertaken in preparation for Soy Food Bazaar in Ethiopia successfully identified potential partners in food nutrition and marketing.

Institutional capacity building requires learning at all levels; both breeders and technicians. Support to JARC had greater impact than support to SARI. The long-term capacity building is a sustainable investment, but staff turnover is such that it is often necessary to invest in many individuals, not just one.

Both JARC and SARI are the very types of development partner that SIL aims to support. Despite many successes, the ME expressed frustration at their attempts to link with some USAID Missions to help build capacity for partners to scale up development efforts supported through USAID Mission funding.

4.8.2 Conclusions

Building partners' institutional capacity increases the long-term sustainability of the SIL Program and its overall objectives in that the partners are able to work with SIL to attract additional funding and continue the activities that they have the capacity to undertake. Productive collaborations established by the ME and developed by the PIs have supported institutional capacity building in the following ways:

1. The use of SIL funds for physical infrastructure such as vehicles, buildings, and equipment;
2. The provision (or joint development) of resources, outputs, or products that can be used by the partner for research and/or development purposes, e.g., germplasm for breeding, Soybean Success Kits for distribution to farmers, curricula for teaching purposes, and ToTs for training purposes;
3. Training and human capacity development for staff and students of research and development partners. These could include short courses and on-the-job training for researchers and technician, seminars at universities, and training of trainers for development projects;
4. Joint proposal development and joint funding awards with partners; and
5. Networking, linkages, and knowledge-sharing among and between partners, e.g., linking soy food entrepreneurs and commercial processors to potential suppliers and customers, linking NGOs to soybean input suppliers, and linking agro-chemical companies to international and national agricultural research centers.

There is a critical need for capacity building in both infrastructure development and training for in-country researchers and technical staff at national agricultural research centers. Both will have variable impacts, which depend on the target institution or individual. For example, they might depend on the degree of management-level support for capacity building, such as whether individual staff are relieved of other duties to allow them to benefit from SIL training opportunities or the individual's capacity and interest in learning and practicing new skills. There is potential to build on and expand networking and linkage activities to further support institutional capacity development. Activities could include strengthening institutional linkages between national agricultural research centers and private sector companies within the soybean industry, both in-country and globally.

4.8.3 Recommendations

[MP] **USAID Missions and HQ should proactively encourage R4D-type collaborations** to support institutional capacity development for USAID contractors and other development agencies. This can be done by, for example:

- Encouraging Missions to promote CLA within their projects. The design of the Malawi AgDiv Project[29]provides a good example of how contractors can be supported to develop R4D-type partnerships with researchers and have the flexibility to develop such partnerships in appropriate ways to support institutional capacity development. (See also Section 4.2.3)
- Organizing in-country partner meetings to include entities supported by USAID HQ and the USAID Mission;
- Having a Mission-based position to coordinate projects funded by HQ and those funded by the Mission;
- Encouraging Missions and HQ to liaise over the timing of their respective new program cycles and build in collaborations from the start;

[MP] As recommended in Section 4.6, **potential in-country institutional partners should be vetted** before resources and capital towards capacity building are offered. The vetting process will allow SIL to better understand the capacity limitations of potential partners.

- Where necessary, steps should be taken to ensure that the inputs (infrastructure, training, etc.) lead to maximum gains, e.g., close supervision and guidance for key staff or step-wise or incremental provision of infrastructure.

[29] This included a project component on Learning & Adaptation. This type of approach to project design has been encouraged by USAID's Learning Lab; see https://usaidlearninglab.org/sites/default/files/resource/files/cla_in_pads.pdf

4.9 EQ 3.2: INSTITUTIONAL COLLABORATION – IN WHAT WAYS HAS THE ME BEEN RESPONSIVE TO REQUESTS FOR TECHNICAL ASSISTANCE FROM USAID (HQ AND MISSIONS) AND HOST COUNTRY INSTITUTIONS? IN WHAT WAYS COULD THE ME HAVE BEEN MORE RESPONSIVE?

4.9.1 Findings

The ME receives requests for technical assistance on a weekly basis, adding up to several requests (approximately 6-12) per month. In the past six months, the types of people/organizations requesting assistance included:

1. Development agencies/contractors/organizations[30] (estimated at 50 percent of requests);
2. Private sector[31] (estimated at 25 percent of requests);
3. Universities[32] (estimated at 15 percent of requests); and
4. Government/public agencies[33] (estimated at 10 percent of requests).

The types of technical assistance requested varies. Some examples from the individuals and organizations listed above include 1) insight into soybean seed systems; 2) assistance in small-scale mechanization development; 3) use of soy in livestock and poultry feed rations/formulations; 4) soy dairy establishment training and village-level soy utilization, processing, and nutrition education training; 5) SMART Farm implementation; 6) soy processing for soymilk, soy flour, and textured soy proteins; 7) participation in and variety provision for the Pan-African Soybean Variety Trial Program; 8) registration of new varieties in country; 9) trialing of new products at SIL SMART Farm locations; and 10) soybean germplasm introduction and varietal evaluations. More than half of the requests come from outside of SIL's five core/original countries.

The SIL ME responds to these requests within a one-week time frame, often within 2-3 days. An initial email response containing relevant resources, links, and contacts is often followed with a conference call to learn more about the needs of the development agency/company/government institution. From there, the ME begins to dialogue and form consortia with the requesting organization, SIL PIs, and other partners to develop concept notes, Memoranda of Understanding, responses to proposals, and other necessary documents so they can access the funding needed to engage in more formal activities. In this way, many of the people and organizations making requests eventually become SIL partners. For example, BASF initially contacted SIL because they were interested in using the SIL SMART Farm as a platform for sharing their Personal Protective Equipment. This led to SIL trialing their inoculant and herbicide products at the SMART Farm, which provided the first third-party testing of these products in West Africa. Palladium was initially interested in SIL's soy dairy work. Since then, Palladium has provided $300,000 in funding to implement soy dairy establishments in Malawi, engage in the Pan-African Soybean Variety Trial in Malawi, and provide food processing technical support to SunSeed Oil Ltd. (another partner listed above). Other examples of partnerships initiated through requests for technical assistance include the following:

- Kansas State University: to evaluate their low-scale moisture meter;
- Makerere University: on soybean breeding and germplasm development and soon they will also become involved in the Pan-African Soybean Variety Trial Program;

[30] Examples from the past six months include: TechnoServe, Palladium, Catholic Relief Services, ACDI/VOCA, International Fertilizer Development Center (IFDC), AGRA, African Development Bank (AFDB), USAID Missions (Kenya, Myanmar), IITA, N8 AgriFood Resilience Programme, WE-Empower, Kedo Solutions, Eden Social Development Foundation, Nuclear Energy Institute (NEI), Cultivating New Careers in Agriculture (CNFA), Longevity Development, African Agriculture Technology Foundation (AATF), Appropriate Scale Mechanization Consortium (ASMC), Syngenta Foundation for Sustainable Agriculture, etc.

[31] Examples from the past six months include: Seed Co Ltd, BASF, Embrapa, Capstone Seeds, Omya, POP Diesel, Guts Agro Industries, XSyn Corporation, Kunifira, Cleber LLC, Verdant Frontiers, SunSeed Oil Ltd., Elfora, etc.

[32] Examples from the past six months include: Makerere University, LUANAR, Unity University, Purdue University, Kansas State University, Mississippi State University

[33] Examples from the past six months include: KALRO, DARS, EIAR, etc.

- MSU: on MSU's upcoming Fisheries Innovation Lab proposal, for which SIL facilitated the establishment of a consortium involving the AquaFish Centre of Excellence at Lilongwe University of Agriculture and Natural Resources (LUANAR), another partner;
- Purdue University: part of SIL's small-scale mechanization network as well as the Appropriate Scale Mechanization Consortium (ASMC); and
- XSyn Corporation, Unity University, Elfora: collaborating to expand the SMART Farm to four locations in Ethiopia.

Apart from interns, the staffing capacity of the ME has remained constant, despite an increase in the number of partners and activities resulting from these requests for technical assistance.

4.9.2 Conclusions

The findings above clearly illustrate the high volume of requests for technical support from a wide variety of organizations and countries. SIL responds to such requests in a timely and thorough manner, and many of the requesting organizations subsequently become SIL partners. The ME's ability to link different organizations into consortia allows for innovative approaches to be developed, which respond directly to partner needs as articulated in their original request for assistance). This also creates opportunities for expanding the R4D work of the SIL Program. These interactions build awareness, knowledge, and capacity among those making the requests and other SIL partners through involvement in new R4D collaborations and activities. In this way, the SIL Program is constantly innovating and expanding its work and its reach, yet the human capacity (in terms of personnel and time) has remained more or less constant, with only additional (yet temporary) support from interns.

The majority (75 percent) of requests for assistance comes from development organizations and private sector companies—both types of organizations SIL (as a research entity) might find establishing links to difficult. This makes it vitally important for SIL to continue responding to such requests and developing the partnerships required for a successful, demand-driven R4D approach.

4.9.3 Recommendation

[HP] It is recommended that **the capacity of the SIL ME is enhanced** to allow it to continue to respond to requests for technical assistance in a timely and thorough manner for the establishment of successful demand-led R4D partnerships and activities. Specifically:

- The staffing of the ME may need to be increased to allow the Director and Associate Director the time needed to respond to requests and engage with new potential partners.
- The staffing of the ME may need to be increased to support proposal development and fundraising needed for new demand-driven activities with new partners.
- A budget line for CLA may be needed to respond to requests for assistance and the development of new demand-led partnerships.

5.0 PROGRAM FUTURE

What specific areas in soybean production and utilization in SSA merit new or continuing investment, including technical research (e.g., breeding vs. feeds development vs. post-harvest management), capacity development and institutional support, and dissemination?

This concluding section summarizes some of the key findings and conclusions presented in the report, and highlights key recommendations and associated actionable items especially important for the program future. Recommendations not already appearing in earlier sections are presented in bold text. This section is presented according to five aspects of the SIL Program that—in the view of the ET—will ensure SIL's continued success.

5.1 R4D APPROACH AND PARTNERSHIPS

An R4D approach can be challenging to understand for researchers and development practitioners alike, but the SIL Program has addressed this through its focus on the concept of R4D products. Furthermore, SIL has recognized the need to work closely with development practitioners when applying an R4D approach and has developed genuine and meaningful relationships with the right types of partners. One way SIL has achieved success is that development partners are now beginning to use development funds (as opposed to research funds) to scale up some of SIL's products and the knowledge associated with them to rural households.

USAID itself can further support success by, for example:

- Having a Mission-based position to coordinate research projects funded by HQ and development projects funded by the Mission;
- Organizing in-country partner meetings to include entities supported by USAID HQ and USAID Missions;
- Encouraging Missions and HQ to liaise over the timing of their respective new program cycles and build in collaborations from the start; and
- Encouraging Missions to promote CLA within their projects. The design of the Malawi AgDiv Project[34]provides a good example of how contractors can be supported to develop R4D-type partnerships with researchers and have the flexibility to develop such partnerships in appropriate ways to support institutional capacity development.

Similarly, SIL can try to be more proactive and assertive in finding the gaps where the Missions need help by:

- A critical review of Mission strategies and discussions with Mission staff; and
- The publication and dissemination of a fact sheet that explains SIL's R4D approach, which might further encourage donors and development practitioners to support R4D-type collaborations.

The ME should also continue to identify and establish new R4D partnerships, especially with USAID contractors, development NGOs, the private sector, and existing, functional public-private partnerships.

Although SIL's concept of an R4D product is useful, in practice the SIL team is still developing and refining its portfolio of products. At least 2 of the current 23 products need clearer definition and articulation (Annexes 6 and 7.1). Box 2 offers a comprehensive definition of an R4D product based on lessons from the products assessed and reviewed. Once an appropriate product has been identified, the research should be designed to support its development and dissemination. The articulation of

[34] This included a project component on Learning & Adaptation. This type of approach to project design has been encouraged by USAID's Learning Lab; see https://usaidlearninglab.org/sites/default/files/resource/files/cla_in_pads.pdf

development/impact pathways is a useful way of checking that a particular product has all the components or associated outputs necessary for its uptake and to maximize the potential for developmental impacts.

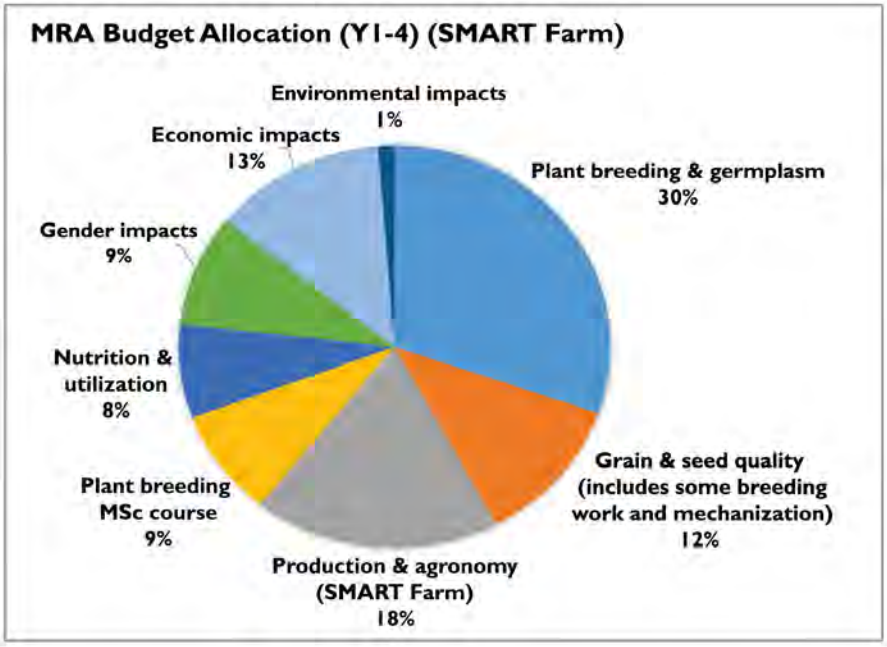
For efficient research design, effective dissemination, and successful uptake, the R4D product concept should provide the starting point for research design and planning.

- The research planning process should include the articulation of development/impact pathways to ensure that a particular product includes all the components necessary to ensure its uptake.

5.2 TECHNICAL RESEARCH INVESTMENTS

Figure 2 shows the budget breakdown across the MRAs to date; this does not account for project-wide costs such as the ME, communications, project-wide in-country hosts, or central overheads. As illustrated in Figure 2, the SIL Program has made substantial investments in practical breeding activities (more than 30 percent of the total research budget).[35]

Figure 2. SIL Research Budget Allocations



There is a question about whether this level of investment in the breeding program is justified. Part of the reason this investment is comparatively high is that the breeding activities are taking place in five countries—the other MRAs tend to work in fewer countries. The key technologies or products being developed from this investment include high-yielding varieties; varieties resistant to rust and other diseases; varieties adapted to low phosphorus conditions; and varieties that require less processing time. Other products include the Integrated Breeding Platform and the Pan-African Soybean Variety Trials (Annex 7), making a total of 6 out of the 23 SIL R4D products (26 percent of total products). As such, the investment in the breeding program is a proportionate contribution to the overall SIL outputs in all of SIL's five key countries. The review of these products suggests that the high yielding varieties will eventually have substantial development impacts, provided that the systems are in place to ensure the availability of seed and the adoption of the varieties by farmers (Annexes 7 and 8.1). Within the breeding

[35] It is not known what proportion of the MRA on grain and seed quality has been allocated for breeding activities.

program for each country, it may be necessary to prioritize the types of improved varieties that should be targeted for continued investment.[36]

Further investment will be necessary to ensure that the seed systems are in place to ensure the availability and accessibility of quality seed of the improved varieties. This will not necessarily involve substantial financial investments for additional technical research, but investments in the partnerships necessary to ensure that the varieties are approved and officially released in a timely manner through the national regulatory systems in each country; support effective seed multiplication and availability; create awareness and demand for the varieties among farmers; and ensure that quality seed is accessible to farmers in remote rural areas. In this regard, new, innovative models for soybean seed multiplication and dissemination will likely be needed.

The second largest research investment to date in the SIL Program is for the SMART Farm (Figure 2). As illustrated by Box 3, the overall conclusions drawn by the ET in assessing the SMART Farm approach (see also Annexes 7 and 8.2) are that investment should continue in the SMART Farm concept and that this should 1) adopt a more inclusive, inter-disciplinary approach so that the SMART Farm provides a genuine "hub" that encompasses a much broader range of SIL's research; and 2) incorporate an extension component to enhance the SMART Farm's ability to provide recommendations and capacity development for the benefit of development practitioners and—ultimately—end users.

The key lessons that emerge from the above assessment of SIL's two most substantial technical research areas are that having the necessary outputs and partnerships is important to ensure that technologies are made available (perhaps through input markets or other innovative models) and are taken up by farmers or other end-users. In this respect, the way the technical research itself is designed and undertaken becomes crucially important. This is where the smaller technical MRAs (notably those dealing with nutrition and mechanization) can usefully share their experiences among the broader SIL team in developing research approaches that are more likely to lead to the uptake of the technologies. For example, this may be done by working closely with the development partners and end users to develop and test R4D products; ensure that the development partners have the necessary technical knowledge to promote the technologies; and have an awareness about (and address) the need for effective markets, market linkages, and marketing.

Investments in the two technical areas that have received smaller investments to date (nutrition and mechanization) should continue, if not increase, due to their likelihood of achieving development impacts—which, as stated above, stems from the way in which the research is designed and undertaken. Investments in gender and economic impacts are also essential, though it is necessary for the R4D products from these MRAs to be more clearly defined (see Section 4.4.3). Social scientists and economists are particularly well-placed to generate evidence on the viability of specific technologies by analyzing the actual costs and benefits to farmers in applying SIL's emerging technologies (see Annexes 7 and 8.2), and also to help design methods and tools for the collection of feedback data on the use of SIL technologies (Section 4.4.3).

It is also necessary to highlight three technical areas that so far have received minimal investments, but which warrant greater attention environmental impacts, seed systems, and pest/disease management. In view of the harmful effects of improper agro-chemicals use, and their widespread availability and growing demand in Africa, R4D's monitoring negative impacts reduction should be strengthened and better integrated across the broader program. Appropriate partnerships with relevant donor-funded projects, NGOs, and other civil society organizations should be established. The need for innovative seed system models and suitable partnerships, mentioned above, will ensure that the improved varieties developed by SIL reach the farmers. SIL has initiated some work on pest and disease management and this needs to

[36] For example, the Ghana breeding program should prioritize (in this order): High yield in appropriate maturities; Shattering resistance; Increased seed size (up to 2800 seeds per pound); Low phosphorus adaptation; Low latitude soybean genetics. The Ethiopia breeding program, on the other hand, should prioritize: High yield in appropriate maturities; Rust resistance; Low phosphorus adaptation; Lodging resistance.

be expanded to include apropos management practices and technologies. This is critically important in view of the presence of soybean rust in Ethiopia (and possibly elsewhere) and the limited capacity for soybean pathology/entomology in Africa.

It is recommended that SIL's current investments in technical research areas should continue and that particular attention should be given to the ways in which technical research is designed and undertaken. Specifically:

- Technical research should be designed and implemented in ways that collaborate closely with the development partners and end users in developing and testing R4D products (see Section 4.4.3); ensure that the development partners have the necessary technical knowledge to be able to promote the technologies (see Section 4.6.3); and address the need for effective markets, market linkages, and marketing in relation to the technologies developed (see Section 4.4.3). Research into markets, market linkages and marketing might form a substantial focus of the economic research MRA.

- R4D products should be prioritized within specific research areas according to in-country needs.
- Continued and increased investment is warranted for1) monitoring and reducing the negative environmental impacts of agro-chemicals used in the soybean value chain; 2) developing seed systems to ensure the multiplication and dissemination of SIL's improved varieties; and 3) managing pests/diseases (in addition to identifying them).
- The recommendations above will necessarily require a more integrated, inter-disciplinary research approach, as discussed in Section 5.4.

5.3 DISSEMINATION, EXTENSION, AND FEEDBACK

SIL's R4D mandate is to provide technical information and training to practitioners who then serve farmers. Providing technical information and training is the researcher's responsibility, and will ensure that the R4D product is taken up and used "correctly" by the intended users. As such, dissemination should be part of the research process (Section 4.5.3). By clearly articulating development pathways for specific products, SIL researchers will be able to identify the different audiences that require awareness, knowledge, and/or training. Where possible, dialogue with key partners who fall within these different audiences can be useful in helping to identify what types of dissemination outputs and communication channels might be appropriate. By working with the communications director, it will then be possible to design and develop the different types of dissemination outputs that are needed to achieve the desired impacts within the development pathway.

The report shows a fine line between dissemination, training, and extension. In some cases, the SIL will need to work closely with development practitioners to promote/extend particular technologies and the capacity development required for their uptake. For example, the mother-baby approach suggested in relation to the SMART Farm (Annex 7.2) involves an on-station farm (the "mother" plot) for research and training purposes [to train NGO agronomists, lead farmers, and extension workers (as trainers) in best management practices and how to design and manage on-farm demonstration plots (the "baby" plots)]. In this proposed model, NGOs, lead farmers, and extension workers should establish and manage the on-farm demonstration plots, and researchers should manage the on-station farm, which should be used as a training site. Overall, however, the approach might be considered an extension activity, and the printed guidelines that would necessarily accompany the training would essentially be an extension manual. In this case, the SIL would have to undertake extension-related activities:

It is recommended that USAID funds extension programming in any future SIL Program to move the project forward; lack of support for extension activities will result in SIL producing products that do not reach their intended audience at an acceptable level for sustained success.

- *SIL must afford extension support by providing to development partners the awareness, knowledge, and training necessary to ensure that R4D products reach the farmers/processors/entrepreneurs with appropriate feedback loops where possible.*
- *SIL's communications outputs should include technical extension information sheets suitable for use by development practitioners, including agricultural extension staff.*

Demonstration plots are widely used as an extension method in Africa, though their efficacy is highly variable. Without proper training—not only in the agronomic management practices to be applied on the baby demonstration plots, but also in the ways in which farmers learn through experimentation, the data or evidence needed to allow farmers to draw their own comparisons and conclusions, and how the demonstrations need to be designed so that the relevant data can be collected—it is highly likely that the proposed demonstrations will not be effective. As such, extension itself may require expert guidance to ensure effective implementation by SIL's development partners. Some development partners, on the other hand, have well-developed extension approaches and methods and merely require understanding of the detailed agronomic management practices for use as content to be incorporated into their own extension tools.

As more of SIL's R4D products are put into use by development partners, farmers, entrepreneurs, and consumers, it will be important for the SIL team to systematically gather and analyze feedback from the users to ensure that the R4D products and associated outputs are relevant and appropriate and being used "correctly." This feedback is part of the two-way flow of information that is essential for effective research and extension. The case of the Soybean Success Kits is a good example. The development partner that adopted the kits did not include all the elements in the kit itself (seed, fertilizer, inoculant), but instead used a voucher to encourage farmers to "purchase" some of the inputs from agro-input dealers who played an important role in implementing the project. The effectiveness of this approach – whether farmers used the vouchers for the intended purpose—and its impact on input markets would need to be analyzed for SIL's researchers to determine whether or not to modify the Soybean Success Kit distribution method.

Feedback loops are essential to ensure that a product and its associated outputs are relevant and appropriate to specific users, whether they are development partners, farmers, entrepreneurs, or consumers. In the case of the thresher, feedback was incorporated into the design and testing phase. However, it is also important that feedback loops are also incorporated into the pilot and scaling up phases, wherever possible. SIL economists and social scientists are well-placed to help design methods and tools for collecting this type of feedback data. They should work closely with the scientists promoting the technology. Gender-related information is particularly important to ensure that women and men have equal access to the knowledge and technologies being promoted.

Extension involves a two-way flow of information, and it is necessary for SIL to gather feedback on the use of its products (by development practitioners, farmers, and entrepreneurs) to ensure that the products are appropriate in different contexts and to make any necessary adjustments or improvements.

- *SIL should develop a clear approach for the provision of two-way extension support to development partners, and this should be funded by USAID.*

5.4 A MORE COMPREHENSIVE VALUE CHAIN APPROACH AND MULTI-DISCIPLINARY, INTEGRATED RESEARCH

One of the findings that emerged from the data compiled through the document review, KIIs, and participation in the SIL events was a recurring contradiction within SIL's value chain approach. While the literature and some KIs repeatedly reported that SIL looks at the whole soybean value chain, others expressed frustration about particular aspects of the value chain missing from SIL's research. Much of the SIL Program focuses on the production node, paying particular attention to technical inputs such as varieties, mechanization, and the use of fertilizer and inoculant. There is also a lot of work around processing and utilization at the household level, and considerable attention is given to small-scale processors/entrepreneurs who produce soy-based foods for local markets. Considerably less attention is given to markets and market linkages, the input markets that make seed, mechanization, fertilizer, and inoculant available to farmers;[37]the markets for farmers to sell their produce; and how these link to large-scale buyers like oil processors and feed manufacturers. All of the soy food entrepreneurs interviewed remarked on challenges in marketing their products, although there has been some attention given to this through the work of the Soy Food Entrepreneur Network. Given USAID's emphasis on developing markets and fostering commercial enterprises, SIL may be able to collaborate more closely with USAID Missions through a greater focus on commercialization practices and entrepreneurship, where appropriate to the soybean value chain.

The ET did not find any soybean value chain mapping being done or disseminated by SIL in the countries where it is working. Nor did the SIL find any explicit analysis of key constraints or opportunities within the value chain. Although some of this is implicit in guiding SIL's work, the ET concluded that a more comprehensive approach to the soybean value chain approach is needed.

The ET recommends basic yet explicit value chain mapping and analysis[38] as an R4D activity to help SIL to determine the sources of current and potential future demand for soybean in each country as well as the markets and market linkages that need to be strengthened within the chain. This can be done using a participatory approach and is often a useful starting point in facilitating the establishment of an innovation platform, through which actors from different nodes of the value chain work together with an innovation broker (e.g., a researcher or development practitioner) to identify challenges and constraints and find ways to address them.

The example of the Soybean Success Kits and input markets highlighted in Box 1 (see also Annex 7.4) also suggests that an interdisciplinary approach is often needed to address the complex challenges involved in promoting soybean production and consumption. In the case of the Success Kits, an economist or social scientist with knowledge of input markets could determine how to promote the sustainable supply of inputs through the private sector. Perhaps this was the intention behind the collaboration across MRAs 2 and 8, although the research was not sufficiently focused on the product and its dissemination (i.e., the sustainable distribution of Soybean Success Kits through the private sector) nor integrated appropriately.

The SMART Farm (Box 3) provides an example of the need for interdisciplinary research and highlights the need for involving the right experts from the start. In this case (Annex 7.2), the addition of a soil scientist and an economist would be valuable additions. These lessons have already been taken on board in Ethiopia, where the SMART Farm involves inputs from a range of specialists.

More generally, there is potential to integrate both gender and environment—often considered cross-cutting issues—across much of SIL's product portfolio. This may require additional efforts by the gender

[37] In the case of the Soybean Success Kits (Box 1), it is recognized that farmers lack access to the inputs for soybean cultivation, and the assumption is that input suppliers and agro-input dealers will step in to provide these inputs once there is awareness and demand from farmers. This assumption is misplaced; agricultural input supply in rural areas remains a considerable challenge in many African countries, and the supply of fertilizer is often controlled by government, making input supply a very complex issue.

[38] See, for example, resources available on USAID's Microlinks website.

and environment PIs to create awareness among other PIs of the need for this integration into specific R4D products and how this can potentially be achieved. As highlighted in Section 4.1:

In relation to the implementation and management of research, the ME should foster greater consistency of the overall research program and greater integration across MRAs where appropriate. This can be achieved through, for example:

- *The program director taking a more proactive role in MRA research design, as required to achieve overall program consistency and to facilitate greater MRA integration;*
- *More discussion at annual research meetings (after MRA presentations, other PIs should be thinking of how they can link into/enhance other MRAs);*
- *All-PI planning meetings to identify linkages and areas of potential integration;*
- *Capacity development by the gender and environment PIs to help other PIs to understand better how to integrate gender and environment into their MRAs;*
- *Joint-PI planning to develop R4D products that require an integrated research approach; and*
- *Greater awareness among PIs about each other's work and approaches (e.g., by having an internal repository of information or by planning for field trips to overlap so that time can be spent in country to see other PI activities and interact informally).*

5.5 INSTITUTIONAL SUPPORT AND CAPACITY DEVELOPMENT

The focus on institutional capacity development is central to USAID's Innovation Labs.[39] Although an explicit academic training component (as in some of the other Innovation Labs) is not appropriate to an R4D approach, SIL has nevertheless incorporated significant institutional support and capacity development into its activities, both formally and informally. SIL recognizes that building partners' institutional capacity increases the program's long-term sustainability.

Despite the challenges of working with African NARS, SIL is committed to partnering with and supporting NARS research centers and universities. The need for NARS capacity development cannot be underestimated and requires substantial investment to achieve impact. Where possible, SIL should align capacity development efforts with those of others such as the CGIAR, AGRA, the Forum for Agricultural Research in Africa (FARA), and the sub-regional organizations, Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Center for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA), and West and Central African Council for Agricultural Research and Development (CORAF/WECARD). In terms of NARS, SIL should continue to accommodate African students, formally and informally (through the initiative of the African research partners), in its research programs at both American and African universities.

SIL has given particular attention to building capacity for training, as in the WACCI masters course and the ToT curricula), and this should continue and be expanded. A current gap needing to be filled is in developing training and training capacity among development practitioners (NGOs, government extension services) to promote soybean cultivation based on best management practices.

To ensure the quality of SIL-provided training and training courses remains consistently high, the ET recommends that SIL maintain an ongoing partnership with the implementing organization to ensure continued capacity development by the PIs.

- *For the Plant Breeding Masters course, this might be achieved by maintaining an institutional link with WACCI through joint research projects and/or staff/student exchanges and internships.*
- *For short courses, this might involve continued collaboration on longer-term R4D activities.*

[39] One of the two key recommendations from the 2012 Board for International Food and Agricultural Development (BIFAD) commissioned CRSP review that led to the emergence of the Innovation Labs was "To develop an overarching and coordinated strategy for engaging U.S. universities in agriculture and food security research and human and institutional capacity development that includes the CRSPs as a central component." See http://transition.usaid.gov/our_work/agriculture/bifad/BIFADREVIEW_CRSP_August2012.pdf

Capacity development through networking and knowledge sharing is effective and should be expanded to other aspects of the SIL Program.

SIL should continue to support institutional capacity building through its collaborations with partners and projects in the ways described in Section 4.8.

- *Networking and linkage activities among value chain actors should be expanded to support value chain development at all levels of the value chain, e.g., identifying ways in which market linkages between commercial processors, traders, aggregators, and farmer organizations can be facilitated.*[40]
- *In some countries, the creation of a national or regional soybean innovation platform or Soybean Association might be appropriate, facilitated by a suitable partner.*

[40] See, for example, the M4P approach: https://www.enterprise-development.org/implementing-psd/market-systems/.

ANNEXES

ANNEX I. EXPRESSION OF INTEREST

EXTERNAL EVALUATION OF THE FEED THE FUTURE INNOVATION LAB FOR SOYBEAN VALUE CHAIN RESEARCH:
EXPRESSION OF INTEREST

I. BACKGROUND INFORMATION

A) Identifying Information

1. Project/Activity Title:	Feed the Future Innovation Lab for Soybean Value Chain Research (Soybean Innovation Lab)
2. Award Number:	AID-OAA-L-14-00001
3. Award Dates:	11/04/2013 to 11/03/2018
4. Project/Activity Funding:	$10,000,000 (Total $25,000,000)
5. Implementing Organization:	University of Illinois at Urbana-Champaign
6. Project/Activity COR/AOR:	Ahmed Kablan

B) Development Context

1. Opportunity Addressed by the Project/Activity Being Evaluated

General Background

The overarching goal of the Feed the Future (FTF) Initiative is to sustainably reduce global poverty and hunger. Limited land availability and variable climatic conditions exacerbate the problem and increase the need for sustainable yet swift solutions. In order to address the challenge, scientific and technological innovations need to be developed that increase agricultural productivity with minimal environmental impact. In support of the broader Feed the Future goal, the Feed the Future Global Food Security Research portfolio aims to advance the productivity frontier, to transform key production systems, and to enhance nutrition and food safety through agriculture.

The Feed the Future Innovation Labs (formerly called CRSPs) were created under Title XII of the International Development and Food Assistance Act of 1975, which authorized USAID to engage U.S. land grant and other eligible universities to address the needs of developing nations while also contributing to U.S. food security and agricultural development. In 2000, Title XII was reauthorized, enabling these U.S. university research efforts to continue "to achieve the mutual goals among nations of ensuring food security, human health, agricultural growth, trade expansion, and the wise and sustainable use of natural resources."

The Feed the Future Innovation Labs draw on the expertise of top U.S. universities and developing country institutions and are an integral part of the Feed the Future Food Security Innovation Center. The Innovation Labs serve to implement the Feed the Future Global Hunger and Food Security Research

Strategy and were established in response to two key recommendations from a 2012 Board for International Food and Agricultural Development (BIFAD) commissioned CRSP review:[41]

- To develop an overarching and coordinated strategy for engaging U.S. universities in agriculture and food security research and human and institutional capacity development that includes the CRSPs as a central component; and
- To leverage the impact of CRSP investments by strengthening links across universities, U.S. government, global programs, foundations, and other donors.

The launch of the Food Security Innovation Center in 2012 enabled USAID to manage its research, policy, and capacity-strengthening portfolio through the following seven thematic areas rather than by institutional home:

- *Program for Research on Climate Resilient Cereals*
- *Program for Research on Legume Productivity*
- *Program for Advanced Approaches to Combat Pests and Diseases*
- *Program for Research on Nutritious and Safe Foods*
- *Program for Markets and Policy Research and Support*
- *Program for Sustainable Intensification*
- *Program for Human and Institutional Capacity Development*

The *Program for Research on Legume Productivity,* which includes Soybean and other Innovation Labs, focuses on increasing the production and availability of nutritious legumes in order to improve food security, nutrition, soil health, and economic opportunities for poor farmers.

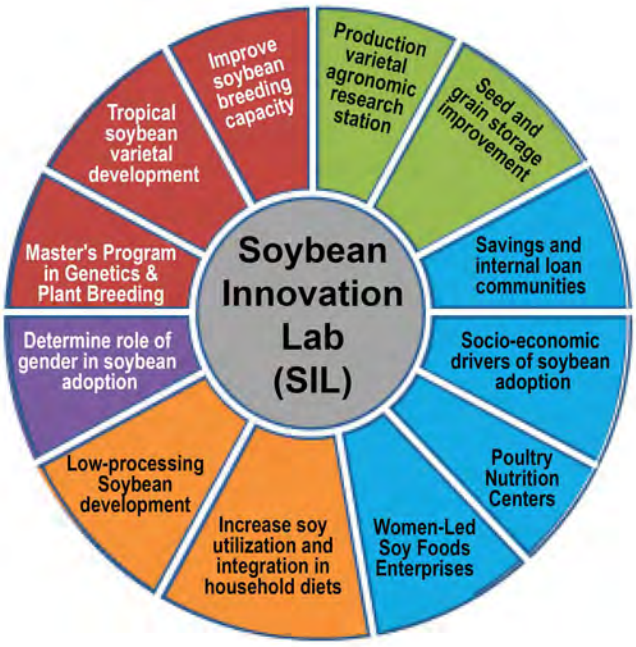
Description of the Soybean Innovation Lab

The Soybean Innovation lab (SIL) is a consortium of leading soybean researchers in the U.S. and Africa. With the support of local research partners, the SIL team designed the Foundations for Soybean in Africa Project (Foundations Project) to provide a replicable Research-for-Development program (Figure 1). This program identifies, adapts and deploys evidence-based technologies and innovations across the soybean value chain (Figure 2). In general, SIL: 1) improves soybean plant breeding in Africa; 2) educates the next generation of African plant breeders; 3) prescribes the best agronomic practices successful soybean production and seed management; 4) identifies barriers to adoption for smallholder farmers; 5) analyzes the role of gender in producing soybean; 6) defines the necessary conditions to ensure environmentally-friendly soybean production practices; and 7) develops practices for sustained utilization of soy at the institutional, household, and micro enterprise levels.

[41] http://transition.usaid.gov/our_work/agriculture/bifad/BIFADREVIEW_CRSP_August2012.pdf

Figure 1. SIL's Research for Development mandate is to provide technical information and training to practitioners who then serve farmers

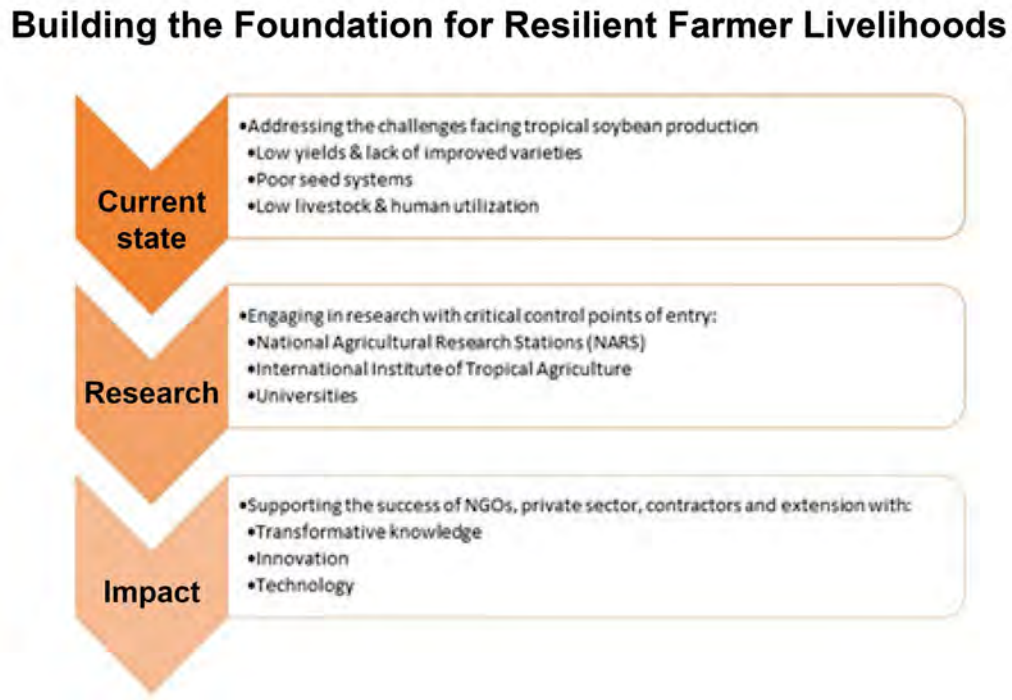
Figure 2. SIL's mandate crosses the entire soybean value chain



Objective

The ultimate goal of the Soybean Innovation lab is to help the research, extension, and private sector establish sustainable production and utilization of soybean in Sub-Saharan Africa (SSA) (Figure 3). Therefore, a central component in the design of the Soybean Innovation lab is not only to perform research that addresses factors limiting the adoption and sustainability of soybean in SSA, but also to readily translate knowledge to research stakeholders, development practitioners, the private sector, and government agencies.

Figure 3. The goal of SIL is to use research and the translation of that research to establish a sustainable foundation for soybean development



The Soybean Innovation Lab's Research-for-Development agenda includes the creation of four research pillars that are essential to addressing the key bottlenecks of soybean adoption, production, and utilization. The Soybean Innovation lab utilizes a coordinated integration of fundamental research, human and physical capacity building, and communication to stakeholders across the four pillars of their program. These foundational pillars address the key bottlenecks preventing the development of soybean in Africa. The Soybean Innovation Lab's agenda only operates through partnerships with government entities, USAID Missions, and local research partners to assure institutional change and sustainability of its transformative efforts. The Soybean Innovation Lab's strategy of embedding within the local research fabric of its target countries links SIL research to key development groups, private sector businesses, and other stakeholders who are interested in applying SIL's evidence-based knowledge, innovation, and technologies in their soybean development programs. SIL research is taking place at key sites [e.g., the Soybean Management and Appropriate Research and Technology (SMART) Farm] and villages in northern Ghana and Mozambique where results can be observed first hand and a high demand for soybean already exists.

The Soybean Innovation Lab's strong communication platform also rapidly publishes and disseminates research findings, technologies, and innovations to broad audiences. This is achieved through the SIL website, the SIL Tropical Soybean Information Portal, in-person and webcasted conferences, lectures and events, regular monthly newsletters and weekly informational digests, third-party publications, and Feed the Future communication platforms including Agrilinks, Feed the Future newsletters, and magazine publications. The Soybean Innovation Lab's synergistic Research-for-Development program produces a comprehensive, evidence-based, and sustainable soybean knowledge system that will outlast the life of the project, and whose modular design allows for direct adoption of the appropriate components by other USAID Missions depending on local needs and policy priorities.

Research & Administration

The approach of The Soybean Innovation lab is based on four research for development pillars that comprise the essential components of sustained production, improved household nutrition, and sustainable market linkages for soybean farmers:

1. Genetic Improvement;
2. Enhanced Crop Productivity and Quality;
3. Nutrition; and
4. Value Chains and Socio-Economic Research.

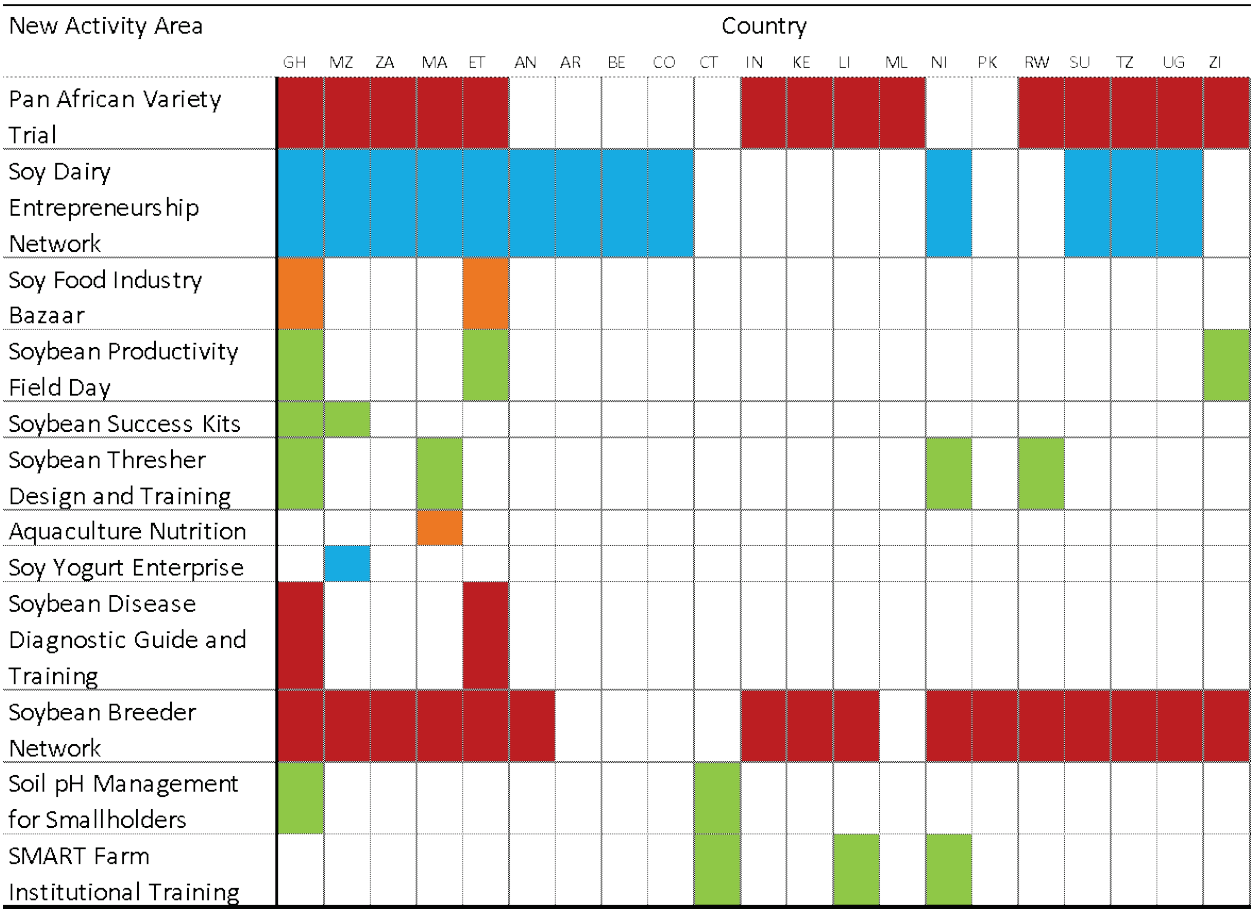
The Soybean Innovation Lab design involves a system of integrated modular research activities that only take place in country and in partnership with local organizations and firms. Original funding allows operating the whole system in Ghana (Table 1). The SMART Farm serves as a hub of SIL activities that leverage the economy from clustering disciplines and activities that range from plant breeding and varietal testing through to utilization, nutrition, and socio-economic research. The Soybean Innovation Lab also introduced a portion of its activities in Mozambique to further validate the essential components for developing a sustainable soybean system that is inclusive of women and small holders. Finally, to achieve the greatest impact, the Soybean Innovation Lab leverages the soybean plant breeder and seed development network and conducts activities in Zambia, Malawi, Mozambique, and Ethiopia, in addition to Ghana.

Table 1. Funds Dedicated and Activites by Country

	Target Countries				
	Ghana	Mozambique	Zambia	Malawi	Ethiopia
Funds Dedicated (%)	67%	23%	8%	1%	1%
Activity List					
1. Plant breeding testing sites					
2. Implementation of the Integrated Breeding Platform					
3. Upgraded plant breeding capacities and equipment					
4. Master's programin plant breeding					
5. SMART Farm research center					
6. Environmental Practices and Impact Assessments					
7. Human Nutriton with "At Home" interventions (3 villages)					
8. Soy in weaning foods study (2 villages)					
9. VitaGoat enterprises (case study)					
10. Savings and Internal Loan Community (case study)					
11. Controlled study on soy sustainability (9 villages: 3 control; 6 test sites)					
12. Women's Empowerment in Agriculture Index (9 villages: 3 control; 6 test sites)					

The original set of activities have expanded to new countries and new activities have developed as well (Table 2).

Table 2. Original programs expanded to new counties and new activities have developed since SIL's inception in 2013



Abbreviation key: GH = Ghana, MZ = Mozambique, ZA = Zambia, MA = Malawi, ET = Ethiopia, AN = Angola, AR = Argentina, BE = Benin, CO = Colombia, CT = Cote d'Ivoire, IN = Indonesia, KE = Kenya, LI = Liberia, ML = Mali, NI = Nigeria, PK = Pakistan, RW = Rwanda, SU = Sudan, TZ = Tanzania, UG = Uganda, ZI = Zimbabwe

The key pillars for the Soybean Innovation Lab research are described below:

Pillar I, Genetic Improvement: An Accelerated Seed Production System

The **Accelerated Breeding and Training Program** was established by providing expertise and tools to existing, but underperforming, public soybean breeding programs in Ghana, Zambia, Malawi, Mozambique, and Ethiopia. The **Germplasm Program** moves large quantities of new genetic material to its overseas partners to introduce high yielding and disease resistance lines into local breeding programs. The Soybean Innovation Lab has a team of soybean breeders from the University of Illinois, the University of Missouri, the University of Maryland Eastern Shore and the U.S. Department of Agriculture's Agricultural Research Service (USDA-ARS) that provide mentorship, equipment, training, and technical expertise to enable these research institutions to produce high-yielding, locally-adapted, and climate-resilient soybean cultivars.

The implementing partners engaged in this work are IITA (Zambia, Malawi, and Mozambique), SARI (Ghana), and the Jimma Agricultural Research Center (Ethiopia). Once developed, registered, and certified, the improved soybean cultivars developed through this project will be available to soybean growers through various local and national networks including the National Agricultural Research System (NARS) and IITA, as well as the large cohort of non-governmental, private sector, and government

agencies with whom SIL partners. One component of the Accelerated Breeding and Training Program included the establishment of a Soybean Module for the Integrated Breeding Platform (IBP). The module uses the web-based tutorial and mentorship program developed by the CGIAR Generation Challenge Program (GCP) and provides SIL project breeders with access to the IBP. In order to identify participants for the training program, we leverage the strategic relationship with IITA and their network of plant breeders.

Pillar II, Crop Productivity and Quality: Soybean Management with Appropriate Research and Technology (SMART) Farms

The **SMART Farm** has three research stations in collaboration with SARI in the three northern regions of Ghana (Nyankpala, Wa, and Bawku). SIL researchers affiliated with Mississippi State University manage the SMART Farm. As noted above the SMART Farm serves as a hub of SIL activities that leverage the economy from clustering disciplines and activities that range from plant breeding and varietal testing through to utilization, nutrition, and socio-economic research. In order to implement the experimental studies conducted at the SMART Farm, an expert in soybean agronomy with a PhD from Mississippi State University, and a native of Ghana, was hired as a full-time SMART Farm manager. The agronomy manager is in charge of **Technology Development and Agronomic Trials**, while SIL's environmental engineer measures and trains colleagues on soybean production and **Environmental Stewardship**. SMART Farm activities include managing research plots evaluating best agricultural practices in planting methods, inoculum use, weed management, seed storage, fertilizer use, soil correction, and disease management, as well as acquiring environmental samples and integrating information generated from breeding programs.

Pillar III, Human Nutrition and Utilization

The Human Nutrition programs conduct research on two critical areas for sustained utilization of soybean at the household level, including "At Home" Nutrition **and Processing** and **Soy-Based Weaning Foods**. The SIL research team and its technical partners have tremendous experience both in research and in the implementation of soy foods supporting child nutrition in households, schools, hospitals, and other institutional feeding programs. The research studies and training are managed by SIL human nutrition researchers based at the University of Illinois. Additionally, through the World Bank's Academic Centers of Excellence program works to establish the national agriculture university of Malawi, LUANAR, as a regional **Aquaculture Nutrition** training and development center.

Pillar IV, Value Chains, Gender, and Socio-Economic Research

The socio-economic research program involves four programmatic areas: 1) a controlled experiment and a multiyear survey in Mozambique and Ghana assessing the impacts of soybean introduction on women's empowerment and equity; 2) a controlled experiment and multiyear survey in Mozambique and Ghana assessing the constraints to adoption of soybean introduction on smallholder farmers and households; 3) a pilot study on the role of a community based micro credit and savings association to support soybean production; and 4) research and management support focused on the sustainability of soy dairy enterprises.

The surveys and studies conducted in the **Soy Sustainability, Value Chain,** and **Gender Equity** programs cross-cut the entire Foundations Project.

2. Target Areas and Groups

Key U.S. Partners

The Soybean Innovation Lab partners with five U.S. universities and the USDA-ARS to lead projects in Africa. These include the University of Illinois at Urbana-Champaign (lead University), the University of Missouri, Mississippi State University, and the University of Maryland Eastern Shore (UMES).

Geographic Reach

The Soybean Innovation Lab's original overseas activities occurred in Ghana, Malawi, Zambia, Ethiopia, and Mozambique. Since 2013, though our activities have expanded, see:

https://www.google.com/maps/d/viewer?mid=1ukItQeQoe_meGf1hJyL1i2E7ZVM&ll=3.096625662722865%2C52.437715999999995&z=3

C) Documents

The evaluation team will review a wide variety of documents provided by BFS, the ME, and by the sub-award partners. The primary documents and types of documents that will be provided are listed below.

- Technical Application proposal
- The Soybean Innovation Lab Annual and Semi-Annual Reports
- Implementation Plans and Annual Work Plans
- Program publications including success stories, research publications, and HICD outputs
- Other Soybean Innovation Lab website materials and information (http://soybeaninnovationlab.illinois.edu/)
- Feed the Future Research Strategy (feedthefuture.gov)

II. EVALUATION RATIONALE

A) Evaluation Purpose

The purpose of this final external performance evaluation of the Soybean Innovation Lab is to provide robust evidenced-based findings, conclusions, and recommendations that BFS can use to inform the decision to renew the award for another five years, to assess needs and address outstanding research questions connected to soybean value chain for smallholders in developing countries and associated value chains to guide the development of new investments in soybean research for development, improve ongoing activity effectiveness, and to assess progress on outcomes. The evaluation results may also be applicable to others who are involved in designing research for development programs.

To accomplish this, the evaluation will assess implementation and progress toward objectives amongst the different Soybean Innovation lab components, including research and dissemination, relevance of research, technology development, and capacity building accomplishments (i.e., delivering on milestones and project proposal as described in the technical application).

Furthermore, since the Soybean Innovation Lab will be completing its first five-year phase in November 2018, the evaluation team is expected to make recommendations to USAID about potential renewal for the award; if the first phase investment delivered on the promised target; and if it was sound investment that USAID should continue by awarding phase II for an additional five years.

B) Audience and Intended Uses

The primary audience and intended users are the USAID/BFS Program for Research on legume productivity, Missions, and implementing partners and universities.

C) Evaluation Questions

Scope of Work

This performance evaluation will provide USAID and the Management Entity (ME) with constructive feedback on the program management, research program, training program, and institutional capacity collaboration of the Soybean Innovation Lab. Specifically, the evaluation team will objectively evaluate the following questions using an evidenced-based and data-driven approach.

Program Management

1. To what extent has the Management Entity effectively implemented and managed the Soybean Innovation Lab's respective research, training, and dissemination activities? In what ways could implementation and management be improved?
2. How effectively did the ME communication and coordination with USAID/BFS, USAID Missions, partners, host country government partners, local researchers, and other stakeholders, as a way to: better achieve project goals and objectives; create and carry out a shared research agenda; improve the capacity of local researchers; and improve dissemination?
3. To what extent has the ME been effective in establishing partnerships with other sectors (private sector, NGOs, USAID Missions, etc.) to help achieve its targets and support the dissemination of research findings as a way to promote sustainable production and utilization of soybean? What opportunities are there to expand collaboration with other relevant partners?

Research and Training Program

1. To what extent did the Soybean Innovation Lab generate quality research technologies/ outputs using appropriate metrics (e.g., peer reviewed publications)? Are the outputs relevant and appropriate for a demand-driven research-for-development project (e.g., did they generate/develop new technologies of relevance to Feed the Future countries that practitioners and/or small holder farmers are likely to use)? What opportunities are there to improve research outputs (in terms of both increasing quality and generating appropriate outputs for Feed the Future countries) moving forward? Describe and highlight which research technologies have had the greatest impact or potential for the greatest impact.
2. How effectively has the Soybean Innovation Lab fostered dissemination of research results to local stakeholders at all levels? In what ways could dissemination be improved (both content and audience) to enhance the uptake of research findings?
3. How well has the program identified and addressed academic and technical capacity needs of host country stakeholders? How could the project better serve and provide for the capacity needs of these stakeholders?
4. How proactive was the ME in responding to research challenges and expanding beyond the scope of the original proposal?

Institutional Collaboration

1. How has the ME performed in establishing productive collaborations with host country governmental and academic institutions, local NGOs, other Feed the Future Innovation Labs, other relevant USAID programs in the target countries? How could the ME improve in building its institutional collaborations as a way to support institutional capacity building?
2. In what ways has the ME been responsive to requests for technical assistance from USAID (Headquarters and Missions) and host country institutions? In what ways could the ME have been more responsive?

Program Future

1. What specific areas, if any, within soybean merit new or continuing investment, including technical research (e.g., breeding vs feeds development vs. post-harvest management), capacity development and institutional support, and dissemination?

III. TIMEFRAME & TRAVEL

A) Timeframe

The evaluation will begin on February 1, 2017 and conclude September 30, 2017.

B) Travel

Two one-week site visits to the Soybean IL in Ghana and Ethiopia are recommended for data collection and observation, and 1 domestic trip to meet with the ME.

IV. DELIVERABLES & DESIGN

A) Deliverables	Date (indicative)
· Concept Note	March 1, 2017
· Draft Evaluation Plan	February 20, 2017
· Final Evaluation Plan	March 28, 2017
· Travel Completion Date	May 15, 2017
· Preliminary Findings Presentation	June 2, 2017
· Draft Evaluation Report	July 15, 2017
· Final Evaluation Report	September 30, 2017

V. TEAM COMPOSITION

The evaluation team will be composed of three members: one evaluation team leader, a senior level technical member, and a mid-level technical member. The pool of potential team members with international soybean research for development experience and relevant expertise outlined is small. Care must be taken to avoid conflicts of interest, drawing from both U.S. and non-U.S. candidates. Each member is requested to submit a CV that demonstrates relevant experience in technical, evaluation and management skills.

Disciplines of all members: The following technical skills should be present among the team as a whole: organizational development, quantitative and qualitative evaluation methodologies, soybean production systems, human nutrition/food safety, soybean agronomy management, and agricultural economics.

Evaluation Team Leader x 1: A senior-level evaluator with a minimum of 15 years' experience in evaluation methodology (including mixed methods evaluation), quantitative and qualitative data collection and analysis, and experience carrying out evaluations of international development projects, preferably with a background in soybean research for development and technology dissemination. The preferred candidate will be familiar with USAID (or other donor) funded programs.

Technical members x 2: One mid- and one senior-level technical experts with a minimum of 10 and 15 years respectively of experience evaluating multifaceted international development research and/or university-based programs. The preferred candidates will be familiar with USAID (or other donor) funded programs. A background in soybean research in the development context, with technical expertise in a field relevant to low- to semi-intensive soybean systems in Sub-Saharan Africa is required.

Specific technical expertise that the team, as a whole, needs:

Team members must have the expertise necessary to evaluate the many sub-award projects, to assess the different technical and programmatic components of the project, including research, management and implementation, capacity development, and partnerships and institutional collaboration, address the evaluation questions rigorously, and collect, triangulate, and analyze primary and secondary data in a robust manner to generated unbiased and evidenced-based findings.

The candidates will also have: a) a demonstrated capacity to conduct independent research program evaluation; b) an understanding of USAID's foreign assistance goals, and its particular objectives related

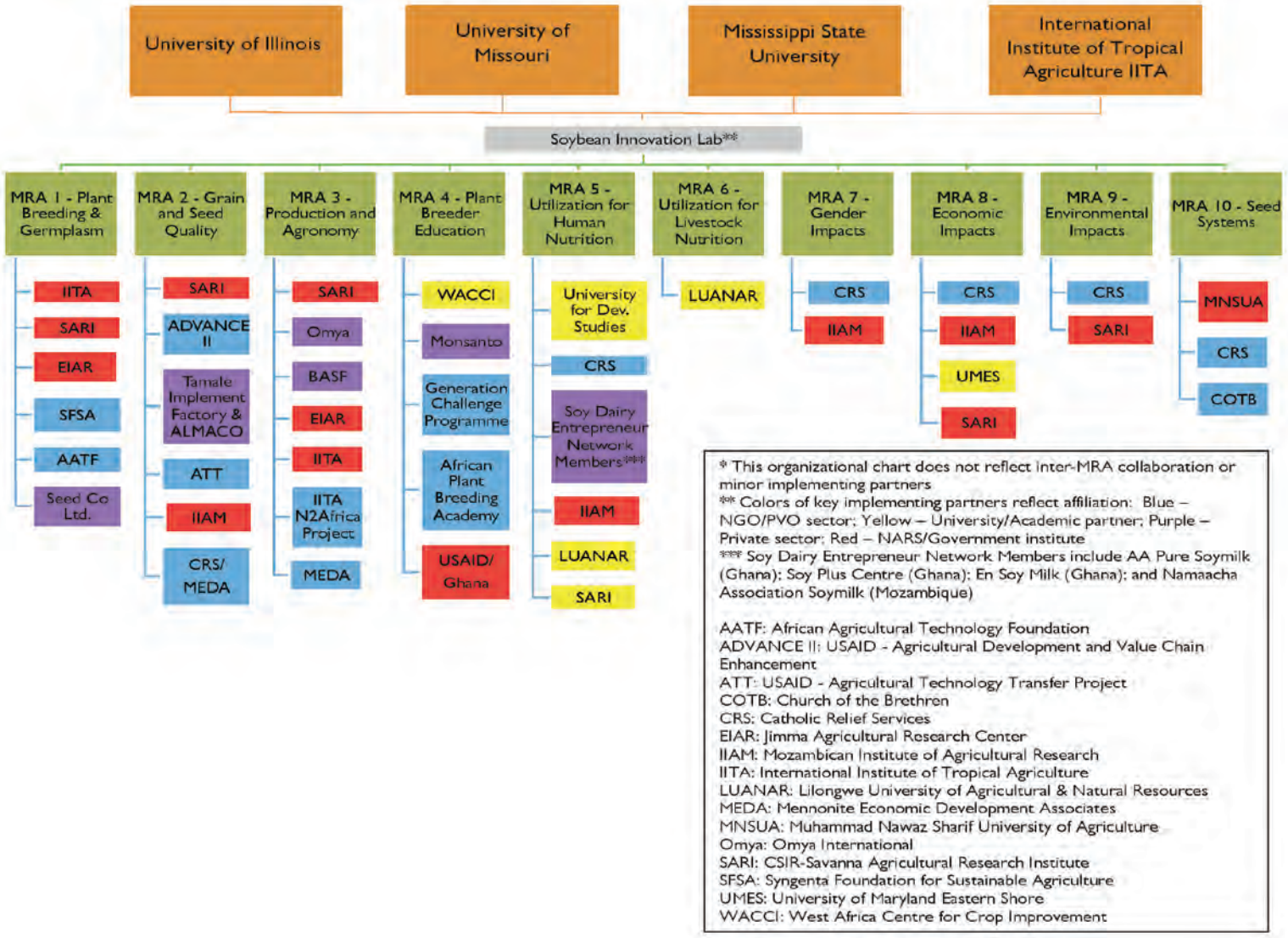
to collaborative research, soybean development, and food security; c) the ability to analyze issues and formulate concrete recommendations orally and in writing; and d) not have any conflicts of interest.

VI. SUGGESTED LOE

Task/Deliverable	Evaluation Team Leader	Technical Team Member	Technical Team Member
Conference Call/Desk Review	4	4	4
Evaluation Plan & Revisions	6	3	3
Data Collection & Travel	21	21	19
Presentation of Findings	2	2	2
Draft Report	5	5	5
Revisions of Final Report	4	2	2
Total	42	37	35

ANNEX 2. SOYBEAN INNOVATION LAB ORGANIZATIONAL CHART OF KEY IMPLEMENTING PARTNERS[42]

[42] Source: SIL Management Entity.


University of Illinois
University of Missouri
Mississippi State University
International Institute of Tropical Agriculture IITA
Soybean Innovation Lab**
MRA 1 - Plant Breeding & Germplasm
IITA
SARI
EIAR
SFSA
AATF
Seed Co Ltd.
MRA 2 - Grain and Seed Quality
SARI
ADVANCE II
Tamale Implement Factory & ALMACO
ATT
IIAM
CRS/ MEDA
MRA 3 - Production and Agronomy
SARI
Omya
BASF
EIAR
IITA
IITA N2Africa Project
MEDA
MRA 4 - Plant Breeder Education
WACCI
Monsanto
Generation Challenge Programme
African Plant Breeding Academy
USAID/ Ghana
MRA 5 - Utilization for Human Nutrition
University for Dev. Studies
CRS
Soy Dairy Entrepreneur Network Members***
IIAM
LUANAR
SARI
MRA 6 - Utilization for Livestock Nutrition
LUANAR
MRA 7 - Gender Impacts
CRS
IIAM
MRA 8 - Economic Impacts
CRS
IIAM
UMES
SARI
MRA 9 - Environmental Impacts
CRS
SARI
MRA 10 - Seed Systems
MNSUA
CRS
COTB
* This organizational chart does not reflect inter-MRA collaboration or minor implementing partners
** Colors of key implementing partners reflect affiliation: Blue – NGO/PVO sector; Yellow – University/Academic partner; Purple – Private sector; Red – NARS/Government institute
*** Soy Dairy Entrepreneur Network Members include AA Pure Soymilk (Ghana); Soy Plus Centre (Ghana); En Soy Milk (Ghana); and Namaacha Association Soymilk (Mozambique)
AATF: African Agricultural Technology Foundation
ADVANCE II: USAID - Agricultural Development and Value Chain Enhancement
ATT: USAID - Agricultural Technology Transfer Project
COTB: Church of the Brethren
CRS: Catholic Relief Services
EIAR: Jimma Agricultural Research Center
IIAM: Mozambican Institute of Agricultural Research
IITA: International Institute of Tropical Agriculture
LUANAR: Lilongwe University of Agricultural & Natural Resources
MEDA: Mennonite Economic Development Associates
MNSUA: Muhammad Nawaz Sharif University of Agriculture
Omya: Omya International
SARI: CSIR-Savanna Agricultural Research Institute
SFSA: Syngenta Foundation for Sustainable Agriculture
UMES: University of Maryland Eastern Shore
WACCI: West Africa Centre for Crop Improvement

ANNEX 3. DATA COLLECTION TOOLS

Annex 3.1 Questions for PI Discussion

1. Within the SIL Program, what are some of the key lessons that you have learned about doing research in an R4D context?
2. What have been the challenges in doing R4D within the SIL Program, and how have they been overcome?
3. Does soybean have development potential? Why/why not?
4. How can this potential best be harnessed to promote development outcomes from future research?

Annex 3.2 Interview Guide for PIs/MRA Leaders

- Position in SIL:
- Month/Year joined SIL (if not from the start):
- Institutional affiliation/position (if not already obvious):
- Approximately what proportion of your time is spent on SIL activities?

1. What are the main activities that your SIL time is spent on and in what proportions? [e.g., administration/management (meetings, work plans, internal reporting, etc.); actual research; training/capacity building; communications products/dissemination; developing and maintaining relationships with partners; etc.]
    a. Do you feel that this is the right balance for this type of program? Where/what activities do you feel you're spending too much time/too little time?
2. For each of the following areas, please give me at least one example of a way for improvement:
    a. SIL Management
    b. Management of your specific MRA(s)
    c. Partnerships and institutional collaborations
    d. Building individual and institutional capacity
3. Do you feel that the institutional collaborations that you have experienced are adequately supporting their own capacity building? What ways best supported capacity building of partner institutions? How could this be improved?
4. What are the outputs from your MRA that you consider to have had the greatest impact (or potential to achieve impact in future) and how are they relevant to demand-driven results for development (R4D)? What lessons have you learned from these successes?
5. In general, how can the outputs/products and the process of generating those outputs be improved in the future?
6. How can the dissemination of those outputs/products be improved in the future?
7. In what ways, if any, has SIL supported you in disseminating/communicating your research results?
8. What are some of the challenges within your MRA that you have found to be most difficult?
9. In what ways have you been able to expand beyond the scope of your original proposal? In what ways has SIL in general been able to do so?
10. Have you had any requests for technical assistance from USAID Missions/host country institutions and were you able to respond? How?
11. If there was to be second phase of SIL, what specific area (from technical research to a completely new MRA theme) should receive new, additional, or continued funding?
12. Who are the key people that we should interview as part of the evaluation?

Annex 3.3 Interview Guide for Lead PI and Program Manager

1. Time allocation:
    a. Approximately what proportion of your time is spent on SIL activities?
    b. What are the main activities that your SIL time is spent on and in what proportions? [e.g., administration/management (meetings, work plans, internal reporting, etc.); actual research; training/capacity building; communications products/dissemination; developing and maintaining relationships with partners; etc.]
    c. Do you feel that this is the right balance for this type of program? Is it what you had expected? Where/what activities are taking more time/less time than you had expected?
    d. If you had more time, where/what aspects would you want to focus on?
2. The Big Picture: For each of the following areas, please give me at least one key achievement/success and one suggestion for future improvement:
    a. SIL Management and implementation
    b. Communication and coordination for the achievement of project goals and objectives
    c. Partnerships with other sectors
    d. Research and training
    e. Dissemination of research results/products
    f. Institutional collaboration
3. What have been the biggest challenges within the SIL Program and how have you overcome them?
4. What are the SIL technologies that you consider to have had the greatest impact (or potential to achieve impact in future) and how are they relevant to demand-driven R4D?
5. In general, how can the outputs/products and the process of generating those outputs be improved in the future, i.e., in terms of both increasing quality and generating appropriate outputs for Feed the Future countries?
6. In what ways has SIL been able to expand beyond the scope of your original proposal?
7. Have you had any requests for technical assistance from USAID (HQ and/or Missions) or host country institutions and were you able to respond? How?
8. If there was to be second phase of SIL, what specific area (from technical research to a completely new MRA theme; management; partnerships; capacity development; dissemination; etc.) do you feel should receive new or additional funding?

Annex 3.4 Interview Guide for Communications Director

- Month/Year joined SIL (if not from the start):
- Institutional affiliation/position (if not already obvious):
- Approximately what proportion of your time do you spend on SIL activities?

1. What are your job responsibilities related to SIL?
2. What are the main activities that you spend your time as communications director? (e.g., web page maintenance, blogging/Twitter, interacting with PIs, development of new communication products or resources, etc.)
3. Do you feel that this is the right balance for this type of program?
4. What communication products appear to have the greatest impact in promoting the success of the SIL? Which have the least impact?
5. Have you changed or altered the direction of the communications program since you were hired?
6. Have you identified new methods/outputs to improve the communication program for SIL? If so, can you provide me with an example?
7. Do you feel you have the support of the SIL Management team? Are there ways in which SIL Management might be strengthened?
8. Do you see opportunities to improve communication among institutional collaborators and if so, in what way?
9. How can the Communication Director improve on the dissemination of SIL products in the future?
10. What are some of the challenges you have found to be most difficult in this position? Have you been able to address these issues?
11. Have you received requests for technical assistance from USAID Missions or host-country institutions? Were you able to respond to these requests in a timely manner?
12. Do you have any suggestions on how the communications program could be better supported by the management team to make the program more effective/efficient in the future?
13. If a second phase of SIL was approved, how could communication of outputs/products to clientele be improved or made more effective/efficient?
14. If a second phase of SIL was approved, what would you suggest to improve communication among institutional collaborators?

Annex 3.5 Interview Guide for Development Partners

- Month/Year joined SIL (if not from the start):
- Institutional affiliation/position (if not already obvious):
- Approximately what proportion of your time do you spend on SIL activities?

1. What are your job responsibilities related to SIL?
2. What are the main activities that you spend your time?
3. What SIL technologies/products appear to have the greatest impact in supporting stakeholders? Which have the least impact?
4. In general, how can outputs/products and the process of generating those outputs be improved in the future?
5. For each of the following areas, please give at least one example of a positive/significant interaction and one suggestion for future improvement of these relationships:
    a. SIL Management
    b. PI for your MRA
    c. Communication and coordination component of SIL
    d. Institutional collaboration
6. Do you feel you have the support of the SIL Management team and/or PI for MRA? Please provide examples.
7. Have you requested technical assistance from SIL? Did you receive it in a timely manner? Please describe.
8. What are some of the challenges you have found to be most difficult in this position? Have you been able to address these issues?
9. What suggestions do you have that would improve your current program in the future?
10. If a second phase of SIL was approved, what specific area of your program do you feel should receive new or additional funding?

Annex 3.6 Interview Guide for Research Partners

- Month/Year joined SIL:
- Institutional affiliation/position (if not already obvious):
- Approximately what proportion of your time do you spend on SIL activities?

1. What are your job responsibilities related to SIL? What percentage of your funding comes from SIL?
2. What are your main research objectives (SIL and non-SIL) in your current position?
3. Which SIL applied research programs and technologies have you seen having the greatest positive impact?
4. Which program(s) need more attention to be more effective?
5. In your opinion, how can SIL help generate more or better quality innovations in the future?
6. For each of the following areas, please give at least one example of a positive/significant interaction and one suggestion for future improvement:
    a. SIL Management
    b. PI for your MRA
    c. Communication and coordination from SIL
    d. Collaborations with colleagues from other institutions
7. Have you requested technical support from SIL? Did you receive it in a timely manner? Describe, with examples.
8. What are some of the challenges you have found to be most difficult in your role as a SIL research team member? Have you been able to address these issues?
9. If a second phase of SIL was going to be approved, what suggestion(s) do you have for improving the impact of your current SIL-related program? For improving the effectiveness of your institution?
10. What research partners not yet affiliated with SIL should SIL reach out to if a second phase is approved?

Annex 3.7 Interview Guide for Students, Junior Faculty, Interns, and Trainees

- What are your university/college, department, and major?
- In your program of study, what year are you in?
- Have you ever worked in a public institution or private company ag-related job?

1. What was your first experience with an instructor either from SIL or trained by a SIL member?

2. In what way did the course you took add an important piece of knowledge/training to your program of study or your job?

3. Is there any connection between this course and a future career in applied soybean breeding for you? If so, are you interested in a job in the public or private sector?

4. In your opinion, how well did this course teach you something that you will use after you graduate? What aspects of the course do you think you will most likely use?

5. Do you have any suggestions for ways to improve the value of the course for someone with your background? For someone who wants to be a soybean breeder? What else would you have liked to learn?

6. If you are interested in a career in plant breeding, how well did this course increase your enthusiasm for becoming a plant breeder?

7. Were real situations taken from applied soybean breeding used as examples in the course?

8. Approximately how many students in the class do you think were specifically interested in a career in soybean breeding?

Annex 3.8 Interview Guide for Advisory Board Members

1. What is the role of the SIL Advisory Board? Do you feel that the current membership/ representation of the Advisory Board is appropriate to fulfill this role for the SIL Program?
2. For each of the following areas, please give me at least one key SIL achievement/success and one suggestion for future improvement:
    a. SIL Management and implementation
    b. Communication and coordination for the achievement of project goals and objectives
    c. Partnerships with other sectors
    d. Research and training
    e. Dissemination of research results/products
    f. Institutional collaboration
3. What have been the biggest challenges within/facing the SIL Program and in what ways, if any, have they been overcome dealt with?
4. What are the SIL technologies that you consider to have had the greatest impact (or potential to achieve impact in future) and how are they relevant to demand-driven R4D?
5. In general, how can the outputs/products and the process of generating those outputs be improved in the future, i.e., in terms of both increasing quality and generating appropriate outputs for Feed the Future countries?
6. If there was to be second phase of SIL, what specific area (from technical research to a completely new MRA theme; management; partnerships; capacity development; dissemination; etc.) do you feel should receive new or additional funding?

Annex 3.9 Interview Guide for USAID Mission Staff

1. What is your role as USAID Mission staff officer responsible for SIL?
2. For each of the following areas, please give me at least one key SIL achievement/success and one suggestion for future improvement:
    a. SIL Management and implementation
    b. Communication and coordination for the achievement of project goals and objectives
    c. Partnerships with other sectors
    d. Research and training
    e. Dissemination of research results/products
    f. Institutional collaboration
3. What have been the biggest challenges within/facing the SIL Program and have they been overcome dealt with?
4. What are the SIL technologies that you consider to have had the greatest impact (or potential to achieve impact in future) and how are they relevant to demand-driven R4D?
5. In general, how can the outputs/products and the process of generating those outputs be improved in the future, i.e., in terms of both increasing quality and generating appropriate outputs for Feed the Future countries?
6. Have you/your colleagues/other USAID projects ever made any request for technical assistance from SIL, and what was the response?
7. If there was to be second phase of SIL, what specific area (from technical research to a completely new MRA theme; management; partnerships; capacity development; dissemination; etc.) do you feel should receive new or additional funding?

Annex 3.10 Online Questionnaire for SIL Researchers/Partners

Q: What is your institutional affiliation with regard to your SIL activities?

[ ] National Agricultural Research Institute
[ ] International Agricultural Research Institute
[ ] Africa-based university or academic institute
[ ] U.S.-based university or academic institute
[ ] Local NGO or civil society organization
[ ] International NGO, Foundation, or donor-funded program
[ ] Private sector company
[ ] Other: _____

Q: What is your primary role in SIL?

[ ] Senior management (e.g., PI, Co-PI, CEO, Chief of Party, Director, Deputy Director)
[ ] Research scientist, postdoctoral fellow, research assistant
[ ] Private sector partner
[ ] Administrative, program, or technical support staff
[ ] Graduate or undergraduate student
[ ] SIL Advisory Board Member
[ ] Other: _____

Q: Indicate country in which you are mainly conducting SIL activities (if regional, check all relevant countries).

[ ] Ethiopia
[ ] Ghana
[ ] Kenya
[ ] Malawi
[ ] Mozambique
[ ] Tanzania
[ ] United States
[ ] Zambia
[ ] Other: _____

Q: Indicate which SIL Managed Research Area (MRA) your SIL activities are most closely aligned with: (check all that apply)

[ ] MRA 1 Plant Breeding & Germplasm
[ ] MRA 2 Grain & Seed Quality
[ ] MRA 3 Production and Agronomy
[ ] MRA 4 Plant Breeder Education
[ ] MRA 5 Utilization for Human Nutrition
[ ] MRA 6 Utilization for Livestock Nutrition
[ ] MRA 7 Gender & Socioeconomic Impacts
[ ] MRA 8 Value Chains & Economic Impacts
[ ] MRA 9 Environmental Impacts
[ ] MRA 10 Seed Systems
[ ] SIL Advisory Board Member

Q: What is your highest level of education?
[ ] High school diploma or equivalent
[ ] Bachelors or equivalent
[ ] Masters or equivalent
[ ] PhD or equivalent

Please rate on scale of 1 to 4, where 1=poor, 2=average, 3=good, and 4=excellent. Circle N.A. if the question is not applicable to your situation.

1. Program Management

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith and Courtney Tamimie) in implementing and managing SIL's research activities?

1 2 3 4 N.A.

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith and Courtney Tamimie) in implementing and managing SIL's training activities?

1 2 3 4 N.A.

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith, Courtney Tamimie and the Communications Director) in disseminating information regarding SIL activities to stakeholders?

1 2 3 4 N.A.

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith and Courtney Tamimie) in communicating and coordinating to achieve project goals and objectives?

1 2 3 4 N.A.

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith and Courtney Tamimie) in communicating and coordinating to carry out a shared research agenda?

1 2 3 4 N.A.

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith and Courtney Tamimie) in communicating and coordinating to improve the capacity of local researchers?

1 2 3 4 N.A.

Q: How would you rate the effectiveness of SIL Management (Peter Goldsmith and Courtney Tamimie) in establishing partnerships with other sectors (private sector, NGOs, USAID Missions, etc.) to help achieve its goals and objectives?

1 2 3 4 N.A.

2. Research and Training Program

Q: How effectively has the SIL generated quality research technologies/products?

1 2 3 4 N.A.

Q: How effective has the SIL been in developing technologies/products that practitioners and/or target farmers/processors/consumers are likely to use?

1 2 3 4 N.A.

Q: How effectively has the SIL fostered dissemination of research results to local stakeholders?

1 2 3 4 N.A.

Q: How well has the program identified and addressed academic and technical capacity needs of host country stakeholders?

1 2 3 4 N.A.

Q: How proactive was the SIL Program in responding to research challenges and expanding beyond the scope of the original proposal?

1 2 3 4 N.A.

3. Institutional Collaboration

Q: How has the SIL Program performed in establishing productive collaborations with host country partners (i.e., governmental and academic institutions, local NGOs, other Feed the Future Innovation Labs, and other relevant USAID programs in the target countries)?

1 2 3 4 N.A.

Q: Has the SIL Program been responsive to requests for technical assistance from USAID (HQ and Missions) and host country institutions?

1 2 3 4 N.A.

3. Program Future

Q: If there was to be second phase of SIL with continued funding, how effectively do you feel that the SIL Program would be able to perform in moving forward in the following priority areas?

Technical research

1 2 3 4 N.A.

Capacity building

1 2 3 4 N.A.

Institutional support

1 2 3 4 N.A.

Dissemination of knowledge/products

1 2 3 4 N.A.

Annex 3.11 Consent Sheet/Information for Interviewees

CONSENT FORM

Performance Evaluation of the Soybean Innovation Lab (SIL)

You are being asked to participate in the SIL Evaluation which has been commissioned by the U.S. Agency for International Development (USAID) Bureau for Food Security (BFS). USAID has contracted Mendez England & Associates (ME&A) to manage the evaluation. ME&A have hired three independent consultants to conduct the evaluation:

- Dr. Kate Longley (Team Leader)
- Dr. Allen R. LeRoy
- Professor Ed Sikora

Why am I being asked?

You have been asked to participate in the evaluation because you have been identified as a SIL partner or stakeholder. Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future dealings with the SIL Program. **If you decide to participate, you are free to withdraw at any time without affecting that relationship.** Approximately 50 interviewees will be involved in this evaluation.

What is the purpose of this evaluation?

The evaluation will assess accomplishments and highlight areas for improvement within the SIL Program. There is the possibility of the program continuing into a second phase, and the purpose of the final performance evaluation is to provide robust evidenced-based findings, conclusions, and recommendations that will contribute to the decision to be made by USAID/BFS in whether to renew the award for another five years. Results from the evaluation will also be used to guide research and implementation of similar programs dealing with high-protein legumes in sub-Saharan Africa and beyond.

What is involved?

Data will be collected through various different methods, including documentation review, key informant interviews, email and phone correspondence, an online survey for SIL Staff and Partners, and a group discussion with Principal Investigators. Data will be collected by members of the evaluation team between July and December 2017. Each key informant interview is expected to last for up to one hour and will take place in the office/workplace of the interviewee, as far as this is possible. The study procedures have been approved by USAID/BFS and by relevant in-country government ministries.

What are the potential risks or benefits? Will my information be kept confidential?

To the best of our knowledge, there is no risk in taking part in this evaluation. Only the three members of the evaluation team will have access to the information that you provide and they will maintain its confidentiality to the extent permitted and required by laws and USAID policies. Your name will be listed as an interviewee in an Annex of the Evaluation Report, and any information that you provide will be non-attributable.

This evaluation will not benefit you directly. It is designed to learn more about the achievements and challenges of the SIL Program. The evaluation results may be used to help SIL and other similar USAID-funded programs in the future.

Who should I contact if I have questions?

Contact the researchers named above if you have any questions about this evaluation or your part in it, or if you have questions, concerns, or complaints about the research.

If you feel you have not been treated according to the descriptions in this form, or if you have any questions about your rights as a research subject, including questions, concerns, complaints, or to offer input, you may contact Florence Nyangara, Senior Evaluation Specialist & Technical Team Leader.

Remember:

Your participation in this evaluation is voluntary. Your decision whether or not to participate will not affect your current or future relations with the Soybean Innovation Lab or USAID. If you decide to participate, you are free to withdraw at any time without affecting that relationship.

I have read the above information. I have been given an opportunity to ask questions and my questions have been answered to my satisfaction. I agree to participate in this research. I will be given a copy of this signed and dated form.

_____ _____

Signature Date

_____

Printed Name

_____ _____

Signature of Person Obtaining Consent Date (must be same as subject's)

_____

Printed Name of Person Obtaining Consent

Annex 3.12. Template for Notes from Documents

Document Number:

Citation:

Document Type: (e.g., Annual reports, Internal M&E reports, Published paper, Comms output, etc.)

Document Location: (e.g., Dropbox, SIL website, Tropical Soybean Information Portal)

Short Overview:

Relevance for EQ1.1: [*insert Doc. No.*] [the "relevance" sections need to be sufficiently detailed to provide the evidence/analysis needed to help answer the Evaluation Question.]

Relevance for EQ1.2: [*insert Doc. No.*]

Relevance for EQ1.3: [*insert Doc. No.*]

Relevance for EQ2.1: [*insert Doc. No.*]

Relevance for EQ2.2: [*insert Doc. No.*]

Relevance for EQ2.4: [*insert Doc. No.*]

Relevance for EQ3.1: [*insert Doc. No.*]

Relevance for EQ3.2: [*insert Doc. No.*]

Relevance for EQ4: [*insert Doc. No.*]

[Delete any of the above EQs which are not relevant.]

Necessary Follow-Up:

Annex 3.13. Template for Notes from Interviews & Discussion

Interview Number:

Name of Individual	Position	Institutional Affiliation	Date

Summary Information:

Implications for EQ1.1: [*insert Interview No*] [the "implications" sections need to be sufficiently detailed to provide the evidence/analysis needed to help answer the Evaluation Question.]

Implications for EQ1.2: [*insert Interview No.*]

Implications for EQ1.3: [*insert Interview No.*]

Implications for EQ2.1: [*insert Interview No.*]

Implications for EQ2.2: [*insert Interview No.*]

Implications for EQ2.3: [*insert Interview No.*]

Implications for EQ2.4: [*insert Interview No.*]

Implications for EQ3.1: [*insert Interview No.*]

Implications for EQ3.2: [*insert Interview No.*]

Implications for EQ4: [*insert Interview No.*]

[Delete any of the above EQs which are not relevant.]

Necessary Follow-Up:

ANNEX 4. TRAVEL ITINERARY

Date	Location
Sept. 27-29, 2017	Urbana-Champaign. Illinois ● KIIs with SIL management and Advisory Board ● KIIs with SIL Principal Investigators, researchers, and post-grads from UIUC, Mississippi, and Missouri ● Round table discussion with PIs
Oct. 16-21, 2017	Tamale, Ghana ● KIIs with SIL researchers and partners, as listed in Annex 5 ● Visits to SARI facilities ● Participation in Kick-Off Event and Soy Food Bazaar
Oct. 21-24, 2017	Accra, Ghana ● KIIs with USAID Mission and Advisory Board Member
Oct. 24-26, 2017	Addis Ababa, Ethiopia ● KIIs with USAID Mission and other partners, as listed in Annex 5
Oct. 26-27, 2017	Jimma, Ethiopia ● Visit to JARC facilities ● KIIs with SIL researchers and partners, as listed in Annex 5

ANNEX 5. LIST OF PEOPLE INTERVIEWED

Position	Institutional Affiliation	Date
SIL Program Director; Professor of Agricultural & Consumer Economics	University of Illinois	Sept. 27, 2017
SIL Associate Director	University of Illinois	Sept. 27, 2017
Director of Budget & Resource Planning, College of Agricultural, Consumer and Environmental Sciences	University of Illinois	Sept. 27, 2017
Assistant Head, Business and Strategic Planning, College of Agricultural, Consumer and Environmental Sciences	University of Illinois	Sept. 27, 2017
PI for MRA 3; Production and Agronomy	MSU	Sept. 27, 2017
PI for MRA 4; Professor Emerita of Crop Science	University of Illinois at Urbana-Champaign (UIUC)	Sept. 27, 2017
Associated with MRA 1; Plant breeding and germplasm. Specializes in soybean diseases	Soybean plant pathologist with USDA at University of Illinois	Sept. 27, 2017
PI for MRA 8; Professor of Agricultural & Applied Economics, Division of Applied Social Sciences	UOM	Sept. 27, 2017
SIL Socioeconomic research team	UOM	Sept. 27, 2017
PhD candidate, SIL Socioeconomic research team	UOM	Sept. 27, 2017
SIL Communication Director	University of Illinois	Sept. 27, 2017
PI for MRA 5, Assistant Professor, Food Science & Human Nutrition	University of Illinois	Sept. 28, 2017
Program Coordinator, MRA 5	University of Illinois	Sept. 28, 2017
PI for MRA 10; Soybean Seed Systems	Retired from Illinois Crop Improvement Association at Illinois Extension system	Sept. 28, 2017
Co-PI for MRA 2; Research Molecular Biologist and Adjunct Professor	USDA-ARS and UOM Division of Plant Sciences	Sept. 28, 2017
Co-PI for MRA 2; Grain and Seed Quality	UOM	Sept. 28, 2017
Co-PI for MRA 1; Plant Breeding & Germplasm	Crop Sciences Department, University of Illinois	Sept. 28, 2017
Co-PI for MRA 1; Plant Breeding & Germplasm	Crop Sciences Department, University of Illinois, also USDA-ARS	Sept. 28, 2017
Associate Investigator, MRA 1; Senior Research Scientist	UOM, Division of Plant Sciences	Sept. 28, 2017
Advisory Board Member & President Emeritus	University of Illinois	Sept. 28, 2017
Advisory Board Member & Chancellor Emeritus	UOM	Sept. 28, 2017
PI for MRA 7; Associate Research Professor	Social Science Research Center, MSU	Sept. 28, 2017
MRA 7; Post-doctoral Research Fellow	Social Science Research Center, MSU	Sept. 28, 2017

Position	Institutional Affiliation	Date
PI for MRA 9; Environmental Impacts	University of Illinois	Sept. 29, 2017
MRA 1; Abiotic Stress Crop Physiologist; Associate Professor	UOM, Division of Plant Sciences	Sept. 29, 2017
PhD student	Department of Agricultural and Consumer Economics, University of Illinois	Sept. 29, 2017
PhD student	SARI & University of Illinois	Sept. 29, 2017
Soybean Breeder	IITA	Oct. 11, 2017
Deputy Director General, Partnerships for Delivery	IITA	Oct. 12, 2017
Country Representative for Ghana	CRS	Oct. 17, 2017
Plant Breeder	SARI	Oct. 17, 2017
Managing Director	AA Pure Soyamilk	Oct. 18, 2017
Managing Director	Ploutizo Enterprise	Oct. 18, 2017
Production Assistant	EnSoy Milk (Food Research Institute)	Oct. 18, 2017
Nutrition Lead	Malawi Ag Diversification Activity	Oct. 18, 2017
Nutrition Specialist	Malawi Ag Diversification Activity	Oct. 18, 2017
Country Project Manager	MEDA	Oct. 18, 2017
Monitoring and Evaluation (M&E) Coordinator	MEDA	Oct. 18, 2017
M&E Officer	MEDA	Oct. 18, 2017
Senior Lecturer/Head of Department	Food Science and Technology Dept., UDS	Oct. 19, 2017
Food Scientist	SARI	Oct. 19, 2017
PI for MRA 3; Production and Agronomy	MSU	Oct. 19, 2017
Deputy Director of SARI	SARI	Oct. 19, 2017
MRA 9; Environmental Impacts	SARI	Oct. 19, 2017
Head of Programs	CRS	Oct. 19, 2017
Program Manager, Agriculture	CRS	Oct. 19, 2017
Chief of Party, Agriculture Technology Transfer Project	IFDC	Oct. 19, 2017
Graduate Student, Ph.D. Candidate in Plant Breeding and Genetics	UOM, Division of Plant Sciences	Oct. 20, 2017
Agriculture Team Leader	USAID Mission in Ghana	Oct. 22, 2017
Advisory Board Member	Retired director of CSIR; Previous director of SARI prior to current director	Oct. 23, 2017
Program Director	Ethiopian Institute for Agricultural Research	Oct. 25, 2017
Science and Technology Advisor organizing Feed the Future activities	USAID Mission in Ethiopia	Oct. 25, 2017
Agricultural Counselor	USDA, Addis Ababa	Oct. 25, 2017
Country Director	TechnoServe Ethiopia	Oct. 26, 2017
Soybean Breeding Project Manager and Production Agronomist, JARC	EIAR	Oct. 26, 2017
Director of the Jimma Agricultural Research Center	EIAR	Oct. 27, 2017
Nutritionist	Jimma University	Oct. 27, 2017
Director, WACCI	University of Ghana	Nov. 10, 2017
Senior Nutrition and Public Health Adviser & SIL Agreement Officer's Representative	USAID, BFS	Nov. 13, 2017

ANNEX 6. OVERVIEW OF SAMPLE PARTNERSHIPS

Name of Partner	Type of Organization	Development Partner or Research Partner[43]	Countries Where Partner Is Involved in SIL Activities	Role of Partner in SIL Program	How the Partner Benefits From SIL
Malnutrition Matters	NGO	Development	Ghana and elsewhere	Provides soy cows and training in the use and maintenance of soy cows to SIL partners	Links with soy cow entrepreneurs; receives feedback on soy cow production stats
Catholic Relief Services (CRS)	NGO	Development, with a role in data collection	Ghana	Helps with administration and logistics in Ghana; collects water samples for testing by SARI Environmental Lab; helped with data collection for social and gender surveys	CRS has reinvigorated and redesigned its Ag Program as a result of interactions with SIL; provided Soy Success Kits to farmers;
Mennonite Economic Development Associates (MEDA)	NGO	Development	Ghana	MEDA is an international economic development organization whose mission is to create business solutions to poverty. MEDA interacts with over 10,000 women smallholder farmers with an interest in producing soybeans.	SIL creates a sustainable ToT model to support local women smallholder farmers in learning the skills needed to ensure continued local production of soybeans.
TechnoServe	NGO	Development	Ethiopia	Collaborated with SIL in developing a proposal for USAID	Proposal was not successful, but has a potential future role as SIL development partner
BASF	Private	Research	Ghana	Allowed SMART farm to evaluate a new herbicide and soil inoculant; also provide personal-protective equipment for demonstration	BASF has the products evaluated by a non-biased entity, and gains exposure with practitioners and farmers; potential future customers.

[43] In this document, the evaluation team refers to "research partners" as the national and international agricultural research systems and the universities and academic institutions; "development partners" are the NGOs and donor-funded projects. Private sector entities can be either research partners or development partners, depending on their function.

Name of Partner	Type of Organization	Development Partner or Research Partner[43]	Countries Where Partner Is Involved in SIL Activities	Role of Partner in SIL Program	How the Partner Benefits From SIL
GUTS Agro Industry	Private	Research	Ethiopia	Nutritious food processing company located in Addis Ababa that supplies corn and soy-based food for the World Food Program	By working with GUTS, Dr. A Tesfaye can learn what soybean grain characteristics they prefer. This information could help guide his selections of breeding lines so that they have characteristics with better functionality for GUTS.
Monsanto	Private	Development	Ghana	Support and participate in training of African students in U.S. as part of the MS program in Plant Breeding and Genetics at WACCI in Ghana	The graduate student interns returning home after a tour of Monsanto's program will probably speak favorably of the company and its products. The interns might also be useful as future employees for Monsanto's effort to enter the seed industry in Africa.
OMYA	Private	Research	Ghana	The SMART farm will evaluate a new product produced by OMYA that may help raise soil pH to acceptable levels for increased soybean yields.	OMYA has the product evaluated by a non-biased entity, and gains exposure with practitioners and farmers; potential future customers.

Name of Partner	Type of Organization	Development Partner or Research Partner[43]	Countries Where Partner Is Involved in SIL Activities	Role of Partner in SIL Program	How the Partner Benefits From SIL
Syngenta Foundation for Sustainable Agriculture (SFSA)	Private	Development	Three regional tests were conducted in Africa in 2015 in Kenya, Senegal, Mali, Malawi, and Zimbabwe.	SIL is collaborating with the SFSA and the African Agricultural Technology Foundation to implement soybean variety tests across several countries in Africa.	Promotion and demonstration of soybean varieties in Africa. May lead to larger market for Syngenta products in the future.
EIAR	Government	Research	Ethiopia	EIAR is reliable research partner that has allowed SIL to expand the soybean breeding program in Africa to conduct breeding efforts, SMART farm research, and health and nutrition programming.	EIAR has benefitted by increasing their budget to support personnel and programs on the station as well as build infrastructure. EIAR has also gained increased knowledge in the area of soybean production.
Ghana Health Service (GHS)	Government	Development	Ghana	SIL collaborates with the GHS to promote soy production for human nutrition.	GHS and the Ghana School Feeding Program has promoted healthy diets for school lunch programs.
Ghana Tourism Authority	Government	Development	Ghana	Ghana Tourism Authority's "See Ghana, Eat Ghana, Wear Ghana, Feel Ghana" campaign was promoted during the SIL-sponsored Soybean food bazaar.	The authority's tourism campaign was promoted during the SIL-sponsored event.

Name of Partner	Type of Organization	Development Partner or Research Partner[43]	Countries Where Partner Is Involved in SIL Activities	Role of Partner in SIL Program	How the Partner Benefits From SIL
Ministry of Food and Agriculture (MOFA)	Government	Development	Ghana	SIL collaborates with MOFA by interacting with their extension practitioners to promote soybeans as part of a sustainable agriculture system.	SIL support MOFA's mission to promote sustainable agriculture and thriving agribusiness through research and technology development, effective extension, and other support services to farmers, processors, and traders for improved livelihood.
SARI	Government	Research	Ghana	SARI is a reliable research partner that has allowed SIL to expand the soybean breeding program in Africa to conduct breeding efforts, SMART farm research, and health and nutrition programming.	SARI has benefitted by increasing their budget to support personnel and programs on the station as well as build infrastructure. SARI has also gained increased knowledge in the area of soybean production.
Jimma University	University	Research	Ethiopia	Researchers and Jimma University have partners with SIL to promote benefits of soybeans in programs targeting nutrition.	Resources/funding provided by SIL benefit researchers at Jimma University by allowing them to expand their programs.

Name of Partner	Type of Organization	Development Partner or Research Partner[43]	Countries Where Partner Is Involved in SIL Activities	Role of Partner in SIL Program	How the Partner Benefits From SIL
IITA	International	Research	The International Institute of Tropical Agriculture's soybean breeding project leader is based in Lusaka and works with national breeders from Zambia, Malawi, and Mozambique.	The IITA soybean breeding program is the oldest in Africa. Most of the soybean varieties grown in Africa today have IITA genetics in their pedigree. The former soybean breeder (now the Deputy Director General of IITA) is on the SIL board of directors. IITA serves as one of the main hubs for plant breeding research in Africa.	The IITA soybean breeding program was in decline before SIL stepped in. SIL has provided the IITA soybean program with new germplasm, field research equipment, and mentoring. SIL has fostered opportunities for collaboration among the breeders from IITA, SARI, and EIAR.

ANNEX 7. REVIEW OF R4D PRODUCTS

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
		P = Primary users; S = Secondary users; C=Communication or promotion partners (to promote use of a specific product)					
1	African Plant Breeding masters degree (tailor-made with WACCI)	Already taken up by WACCI faculty and grad students (P) MS graduates will work for public institutions in Africa which will benefit from their improved education (S)		MS graduates will work for private sector institutions in Africa which will benefit from their improved education (S)	High: PI would like to take the WACCI MS program model to other universities	Continued internship program and research grants for WACCI (both ongoing with non-SIL funds)	Training future generations of African plant breeders is essential for a sustainable supply of improved crop varieties.
2	Mechanization & thresher training (Soybean thresher design and technical specifications)	High, e.g., development NGOs; fabrication training centers; agricultural research centers (P)	Farmers likely to use threshers themselves (not the design or technical specifications) (S)	High, e.g., blacksmiths or entrepreneurs who are able to manufacture and rent out thresher; possibly also soybean seed companies (P)	High: Need for technical specifications for replication of design by others (ongoing)	Need for economic data to show viable business models for fabrication, management and use (e.g., cost benefit analysis)	Increased availability and use of threshers will lead to higher quality soybean grain and less labor inputs by farmers. Need a community based assessment (CBA) to show that threshers are profitable for manufacturers, owners, and users.
3	Tailor-made gender awareness training for SIL researchers (to be developed as part of "Empowering women")	High potential for uptake by SIL researchers and possibly other research teams (P)			Medium likelihood of replication for other research teams outside of SIL (P)	Additional "empowerment" messaging could be integrated within other training and extension products.	Greater capacity for gender responsiveness of SIL researchers should lead to greater gender responsiveness of SIL Program and products.

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
4	Environmental Analytical Testing Lab (tailor made with SARI)	Already taken up by SARI (P)	Better-off farmers, NGOs, and MOFA extensionists likely to use lab services for water quality analysis and soil and tissue testing as agricultural intensification increases in country (S)		High potential for lab service to expand across Ghana and even neighboring countries if demand exists and lab results prove to be accurate and reliable; with a sustainable business model, lab could potentially be replicated in other NARS (P)	Need for proof of accuracy and reliability of lab results over time; technicians at SARI need to be trained in order to take responsibility in making recommendations based on lab results; need to advertise lab services and create demand	Capacity development of SARI service facility and staff; lab would offer services to farmers to increase yields though soil testing, and monitor water quality in farm communities to avoid safety issues related to E. coli and pesticides in local water supply
5	High-Yielding Varieties from African Breeding Programs	Germplasm, capacity development and equipment already taken up by SARI, IITA, and EIAR (P); high potential for HYVs to be promoted by many practitioners, e.g., MOFA, CRS, MEDA, ATT, etc. (C)	High: farmers are the main target consumers (P)	High: With appropriate licensing arrangements, seed companies may produce and sell HYV seed (P). Grain buyers and processors will utilize HYV grain produced by farmers. (S)	High: The new varieties will eventually find their way into other countries as direct variety releases and/or breeding parents. SIL may expand breeding support and breeder to breeder seed exchange to Nigeria, Uganda, Rwanda, etc.	Fact sheets for new variety releases that include comparative yield, protein and oil data, and rust susceptibility ratings; off-station field day presentations to compliment Kickoff Day presentation	High potential for improving the yields and incomes of rural farm communities if producers can receive fair prices for the grain and seeds. Protocols for information and seed dissemination will need to be worked out by practitioners.

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
6	Household Soy Processing & Utilization Training Courses	Course curriculum was co-designed with AgDiv Project (Malawi) (P) and 43 Malawian trainers have been trained (P)	Farmers in Mozambique participated in these courses (delivered directly by SIL). Training is now being delivered to farmers through the AgDiv project in Malawi. (S)	Soy dairy entrepreneurs in Malawi have participated in training provided through the AgDiv project in Malawi (S)	High: Course curricula can be adapted for use in different countries and ToTs conducted with other projects/ practitioners (P) for the benefit of smallholder households and entrepreneurs (S).	This product already includes: the course curriculum developed with AgDiv; an extension guide (slide deck); instructions to make a tofu press box; and promotional videos.	Increased awareness among farmers about HH soy utilization can potentially increase adoption and production by farmers. If households and small-scale entrepreneurs can produce and promote a range of affordable and tasty soy food products then this can lead to increased soy consumption and nutritional benefits among consumers.
7	Integrated Breeding Platform[44]						
8	Low-Cost, Locally-Produced, Small-Scale Mechanization	High potential to be promoted by many practitioners like MOFA, CRS, MEDA, ATT, etc. (C)	High potential for use by farmers, farm communities, and breeders (P)	Depending on the capacity of the equipment, entrepreneurs could start crop service businesses. (P)	High for its ability to address the needs of soybean growers throughout Africa	Training and locally obtainable parts (See product #2)	Potential to increase crop production, lower costs, and expand soybean production acreage

[44] This product was not reviewed by the ET.

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
9	Low-Latitude Soybean Genetics	Soybean breeders are main users (P). Because this is a germplasm development effort, the "product" will probably require a breeding cycle or two before varieties are released that benefit from this research.		If this germplasm works as hoped, major African and global seed companies may want to license it. (P)	High potential as a breeding tool for transferring yield and disease resistance genes from higher latitude germplasm; potential to significantly increase yields or shorten variety development time	Sufficient testing and a significant average improvement in: 1) the yield of its progeny versus checks; or 2) the time it takes to develop new varieties from high x low latitude crosses	Hard to speculate yet on what level of impact is likely
10	Low-Phosphorous Soybeans	Soybean breeders are current users of this ongoing research (P). This is a germplasm development effort and the "product" will probably require a breeding cycle or two before varieties are released that benefit from this research.	Farmers will be end users of the varieties once they are released and made available (P)	If this germplasm with markers works as hoped, major African and global seed companies may want to license it (P)	Medium: If successful, this trait and associated DNA markers will have high value as a breeding tool to reduce production costs in low phosphorus soils	Sufficient testing to prove its ability to reduce the level of soil phosphorus required for optimum soybean grain yield in its progeny	Hard to speculate yet on what level of impact is likely
11	Low-Processing Soybeans[45]						

[45] Unable to assess this product because it is not certain whether or not a viable product will be possible; more breeding and research is needed. Processing time has not been reduced enough. Not counted in overall assessment metrics.

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
12	Pan-African Soybean Variety Trials	Already taken up by soybean researchers (P). Very useful as a means of showcasing the collective performance of soybean varieties from many different African breeding programs	Farmers will likely adopt the varieties from the trials (S)	Enables the process of connecting breeding programs (P) across Africa with each other and with African and Global seed companies (S) and grain processors (S)	High potential; the number of trial sites can be expanded to include more regions of Africa	Testing locations in Ghana and Ethiopia; Streamlined Material Transfer Agreement signing process	Will to lead to much faster variety recognition and acceptance across African countries. Requests for seed for parental material or direct release will likely be granted if agreements are met. Could result in an increase in the rate of spread of superior soybean genetics across Africa.
13	Pesticide Management & Safety Course	Course needs to be designed, packaged, and promoted in a way that allows NGOs, MOFA, and others (P) to implement it, i.e., through ToT.	Farmers will benefit from the training itself if course is designed, promoted, and implemented well. (S)	Potential for agro-input dealers (S) to pass on knowledge to farmer customers if they are trained and provided with appropriate extension materials	High potential for expansion across Ghana if training by ToTs continues with support from SIL with help of extension materials	Need for development and distribution of extension materials such as fact sheets that support education programs in farm communities	This course promotes the safe use of pesticides. Educational resources and training are used to help pesticide applicators receive the knowledge to safely make use of all pesticides. This program can potentially have an impact on personal safety, storage, and disposal of pesticides, environmental and water quality protection, and food safety.
14	Smallholder Soybean Adoption	Future products from this activity are described as "alternative models of bundling seed, inputs, and training […and…] differing approaches to information communication technology extension and new models promoting greater financial liquidity."[46] There has been a lot of data collection, analysis, and reports of potential use to researchers, but it is not yet clear how or when these products will be developed, apart from Product No. 21 (see below).					

[46] This quote is taken from the SIL website: http://soybeaninnovationlab.illinois.edu/smallholder-soybean-adoption-0

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
15	SMART Farm	AgDiv Project (Malawi) (P) has expressed an interest. Addition of on-farm plots will allow uptake by practitioners (P) to demonstrate benefits of technologies tested at on-station SMART farms.	With effective extension, farmers will likely use technologies that are seen to be appropriate and effective in growing soybeans. (S)	Private sector agro-input companies benefit through having their products tested on the SMART Farm. (S)	High potential for expansion in Ghana if employed as small-scale demonstration plots in farm communities; high potential for expansion in other Feed the Future countries	Need for extension materials to support SMART farm concepts that can be used in ToT events and on-farm community trainings	SMART farm will have a high level of impact if technologies (e.g., phosphorus, inoculant, BMPs, etc.) are available and accessible to farmers and information produced at farms is disseminated in an effective way.
16	Soy Dairy Enterprise Network	Practitioners who are aware of the Network might promote it among the entrepreneurs that they support. (C)		Network members include over 30 entrepreneurs from 10 countries. (P)	High potential for expansion of the Network membership; need to be clear on the types of entrepreneur to be targeted and the ways in which support will be provided	A review of the literature on knowledge sharing networks might identify ways in which the Network could be even more effective.	Network members have the knowledge to improve the production, profitability, and quality of their products and to improve their business skills and marketing, leading to increased incomes for entrepreneurs. Potential for increased consumption of higher quality soy products.

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
17	Soy Food Recipe Database	Potential for use by nutritionists and food scientists (P); development practitioners (P) might use it to develop a recipe book and/or promote it among entrepreneurs and households	Potential for use by farmers/ consumers with Internet access (P)	Potential for use by chefs and entrepreneurs with Internet access (P)	Database is continually expanding.	Medium: This is a low-cost product that can potentially be re-packaged (e.g., as a recipe book) and promoted for greater impact; the need to understand what kind of demand for recipes exists.	Potential to increase awareness of soy food products and the range of soy-based dishes prepared by households, entrepreneurs, restaurants, hotels, etc.
18	Soy-fortified Complementary & Weaning Foods	High potential for promotion by Ministries of Health and Agriculture, NGOs, and UN agencies (WHO, UNICEF, FAO) (C)	With awareness and appropriate training, high potential for uptake by rural households (P)	Possible that baby food manufacturers might incorporate soy into their formulas (P)	High potential for replication, provided that evidence for nutritional benefits is made available	Robust evidence of nutritional benefits of soy; briefing papers targeting policymakers and practitioners	Increased dietary diversity in the first 1000 days of life
19	Soybean Disease Diagnostic Guide	High potential for use by NGO practitioners, extensionists, and soybean researchers (P)	High potential for use by farmers (P)	Potential for use by agro-input dealers if guide is expanded to provide advice on which inputs to use to control diseases (P)	High: Disease guide could be used in all Feed the Future countries where soybeans are a target crop	Need for additional guides or extension material that focus on other issues related to soybean production such as weeds and insect pests	Low impact as guide will help growers and practitioners identify diseases but will not necessarily offer suggestions on how to control these diseases; guide will be a good resource for practitioners and extensionists in advising growers on disease problems.

Product No.	Product (and additional details)	Likely Use or Uptake by Researchers/ Practitioners/ Policymakers	Likely Use or Uptake by Farmers/ Consumers	Likely Use or Uptake by Processors/ Entrepreneurs	Potential for Replication/ Expansion	Need for Additional Associated Outputs	Likely Developmental Impact of the Product
20	Soybean Extension for Smallholder Farmers[47]						
21	Soybean Success Kits	Already taken up by NGOs (C) in Ghana and Mozambique	Already taken up by farmers in area where kits were made available (P)		High likelihood of expansion through development practitioners (C) in countries interested in soybeans	Need for additional NGOs to take lead on distribution of kits in other regions of Ghana and other countries targeted by SIL	Kits have been shown to increase farmers' yields and are also likely to promote adoption of soybeans by smallholders, thus increasing soybean production, both for sale and household consumption. in targeted countries.
22	Tasty Mozambique[48]						
23	Viable Inoculum for Africa[49]						

[47] This product was not reviewed by the ET. In general, the Evaluation Report recommends greater attention should be given to extension.

[48] This is a recent and low-investment product and therefore was not reviewed by the ET.

[49] This is a recently added product and was not reviewed by the ET.

ANNEX 8. SELECTED PRODUCT CASE STUDIES

ANNEX 8.1 Case Study of High-Yielding Soybean Varieties from African Breeding Programs

The Soybean Innovation Lab is collaborating directly with its partners at the NARS in Ghana and Ethiopia and with the IITA in Zambia and Malawi to develop high-yielding, disease resistant, African-adapted soybean varieties in an effort to improve the production capacity of smallholder soybean farmers.

This work includes developing cultivars that are resistant to rust and bacteria pustule, can more efficiently fix nitrogen, can better tolerate the low phosphorus commonly found in tropical soils, and can be easily processed for household consumption. This is accomplished through the introduction of high-yielding, diverse cultivars from the U.S. Germplasm Collection, crossed with locally adapted African varieties.

Part of this process involves direct mentorship of the head soybean breeders at these institutions through both Africa- and U.S.-based technical training, knowledge sharing, and resource support, and through the provision of research equipment necessary to increase the scale and efficiency of the national African soybean breeding programs.

1. **Partners involved in the product research, development, dissemination, and/or feedback—their roles and inputs. [EQ 1.3]**

SIL collaborates with three African soybean breeding project leaders at SARI in Ghana, the Jimma Agricultural Research Center in Ethiopia (EIAR), and the IITA in Southern Africa. The IITA breeding project leader is based in Lusaka and works with national breeders from Zambia, Malawi and Mozambique.

In 2017, SIL and Syngenta's Foundation for Sustainable Agriculture (SFSA) coordinated the Pan-African Soybean Variety Trial Program in nine African countries. 2017 was the third year for implementation in Kenya and Malawi and the second year for Mali. Participation in this yield trial collaboration by public and private organizations is supported by an online webinar series provided by SIL and SFSA, who will also compile, analyze, and report the results. The program is designed to evaluate the yield potential of elite breeding lines from many different programs across Africa. If a line does well in the trial, there is a good chance that the breeder of the line will be contacted by seed providers from African countries participating in the test expressing their interest in marketing the line to their local farmers. Another significant outcome of the exposure of good performing lines in the trials is the ability this brings the breeders participating in the program to know which lines they should request from the originators to use as parents in their breeding programs, provided that a formal Material Transfer Agreement is signed by both parties.

In the fall of 2017, with funding from USAID's Ag Diversification Project, a multi-institutional collaboration began between IITA, SIL, SFSA, the African Agriculture Technology Foundation, the Department of Agricultural Research Services (DARS) Malawi, and private seed companies, Seed Co, MRI-Syngenta and ZamSeed. The result will be a test of 30 soybean breeding lines, released varieties and elite experimentals, across nine different locations in Malawi. This is the first test of its kind in Malawi. As part of the preparation for the trials, team members from SIL and IITA conducted presentations on soy production methods and field plot techniques for the Malawi test site managers.

2. **Quality and relevance of the product/technology itself; how can quality/relevance be improved? [EQ 2.1]**

The actual products of the African breeding programs, assisted by SIL's U.S. and African-based support, are the anticipated superior performing soybean varieties. Since the new varieties have yet to be identified and are at least two years away from being released for seed production, the following comments refer to the quality and relevance of **the inputs** provided by SIL to the African breeding programs.

The introduction of new soybean germplasm to Africa from the USDA has not happened for decades. This new infusion and the effort to get soybean breeders within Africa to cooperate with each other and with breeders from the U.S. is extremely significant. If one could use the example of pillars within a continental soybean variety development scheme, this pillar is the most important. To add to the relevance of the germplasm and encouragement to cooperate, SIL also made a positive contribution to the second most important pillar. They provided the African breeder-partners with some modern field research equipment to increase the numbers of breeding lines that they can efficiently move through their programs. Since the yield potential within soybean breeding populations is normally distributed, the ability to find the highest yielding individuals increases with the number of individuals tested. Therefore, creating large numbers of individuals and screening them efficiently is a basic requirement for successful variety development. The importance of this fundamental rule cannot be over emphasized.

Because these African programs are so rudimentary, the breeders have many equipment needs. For example, one of the breeders remarked that the greatest tool he was given by SIL was a pickup truck.

3. **How it was disseminated; how could dissemination be improved? [EQ 2.2]**

For the same reason given above for EQ 2.0, the following comments refer to the dissemination of the inputs provided by SIL to the African breeding programs. There have been mixed results from SIL's input dissemination process in terms of the African breeders' ability to capitalize on them. In general, as far as the ET could determine, the results so far produced by the IITA breeding program have met SIL expectations. For the other two programs, it was evident that the results from the Ethiopian program were more positive than SIL expected, especially in terms of the breeder's performance, while the results expressed by the Ghana program did not meet expectations. The Ghana program must be a frustrating and complicated situation for SIL. However, the lessons learned from this experience will probably enable SIL to be better at ensuring positive outcomes from their future collaborations with public soybean breeders from other African countries. For example, before a future collaboration begins, there might be a preliminary inquiry into the breeder's work ethic and level of enthusiasm for achieving recognition through variety development. Perhaps an assessment of the work culture of the government institution that employs the breeder would also be helpful. Knowing what, if any, direct compensation could be given to a breeder for successful delivery of superior varieties may also be of value. If there isn't a system in place for the breeder to receive a small percentage of the royalty stream, one might be initiated at SIL's request. If signs look negative after investigating these issues, and SIL still feels compelled to collaborate because there are no other choices, a slower capacity building effort may be called for together with more oversight from SIL breeding leadership and requirements for the timely completion of verifiable milestones.

4. **Potential for sustainability/to achieve development impacts. [EQ 2.1]**

The initial steps that SIL has taken in the past four years to enable soybean breeding programs in SSA have a good probability of establishing a platform that leads to African soybean seed and grain industries taking hold and flourishing with farmers' yields rising in proportion to their adoption of the new varieties. The rate of growth of the industries might resemble what was seen in the early days of soybean expansion in countries like Brazil and Argentina. Down the road as the new varieties take hold and the private sector steps in, SIL's strategy for enabling national breeding programs may need a shift in focus to something like leadership training for the breeders/project supervisors. This effort of training the trainers so they can improve the performance of their staff could help to sustain these valuable programs. Ironically, in the distant future, the national soybean breeding programs may become by default the only supplier of new varieties to the subsistence farmers who can't afford to buy seed company products.

5. **Ways in which capacity was developed through the application of the SIL inputs—either individual capacity and/or institutional capacity [EQ 2.3, EQ 3.1]**

Germplasm

- Greatly broadened the genetic variation within each African breeders' germplasm pool, which in the past mostly consisted of IITA genetics
- Added genes for rust resistance and early maturity
- Added genes for larger seed size to help compensate for the small size from the IITA breeding lines
- In the future, germplasm donated by SIL will add genetic variation for low phosphorus adaptation and there will be molecular markers linked to some of the major genes influencing the trait.
- Crosses made between lines from the Illinois breeding program and lines from IITA looked remarkably well adapted in the nursery plots in the JARC fields. To see successful results this early in the program from combining the two germplasm pools suggests that the rate of yield gain will be relatively rapid for this program.

Mentorship

- Very positive exposure to breeding programs and project leaders based in the United States
- Opportunities to motivating and share knowledge with the African breeders gave SIL breeders the ability to recommend important changes such as going from one to two nursery growing seasons per year to shorten their variety development timeline.
- Ongoing interactions with SIL mentorship provided by the U.S. breeders annual visits to the African programs, Skype-based access to SIL's monthly staff meetings, direct conversations with the U.S. breeders and the program ME, and many email exchanges with the U.S. breeders throughout the year.
- Travel to a workshop on molecular marker assisted selection held at IITA headquarters was provided for the SIL African soybean breeders
- Encouragement to interact with the other SIL-based African breeders
- Encouragement and funding provided to attend the African Plant Breeders Academy
- The SIL-funded U.S. graduate student seems to be a positive role model for some of the staff at the SARI station.

Equipment

- Much needed bundle and single plant threshers were provided to the Tamale program soon after the SIL started.
- SIL has provided the soybean breeding program at IITA with a push planter and high-quality threshers to handle anything from single plants to four row yield test plots.
- The breeding program at the Jimma, Ethiopia station was helped a great deal by the truck that SIL provided. SIL also provided threshers and the construction of a small building used for office and lab space.

- The cold storage and seed handling lab underway at the Tamale SARI station will be well received when completed and should help the program to improve the quality of the research field plots
- With the threshing equipment, SIL breeders from the U.S. also provided training on safe handling and adjustments to maximize output and seed quality.
- SIL connected soybean breeders in Ethiopia to the Integrated Plant Breeders Program. Software technicians working for CGIAR visited the JARC, installed software, and held a training session.
- SIL provided IITA in Ibadan, Nigeria with a high-performance device for molecular marker analyses and conducted a training workshop there in 2017.
- The Jimma soybean breeding program has grown more than 10 times as a direct result of SIL's application of the breeding MRA products: germplasm, mentorship, and equipment.

6. Research challenges and how they were dealt with [EQ2.4]

The Low Phosphorus Adaptation research program lost a year of data and found that more thorough communication with the African soybean breeders is necessary.

The leader of one of the breeding programs faced various challenges relating to quality and timeliness. The U.S.-based breeders and ME have been trying to address this through closer supervision and additional support.

7. Future investments required [EQ 4.1]

An improvement in the quality of Internet video-based communications is seriously needed. A lot of the breeders' interests in cross MRA exposure could be satisfied with a reliable clear connection to the discussions at the SIL meetings.

Equipment for mechanized planting is needed. It currently takes three to four weeks for the Jimma project to plant all of their plots by hand, and their plot numbers are sure to increase over time. For a program like the one at Jimma where they have access to a tractor, it makes sense to try to provide them with a research plot planter. It does not have to be a new one. It is relatively easy to find used planters in the Midwest of the United States.

The SIL African breeders are very interested in using molecular markers in their programs. An effort should be made to clear up any misunderstandings they might have about the plans that SIL has for them regarding the use of marker assisted selection as a breeding tool. They should be fully aware that they are currently developing populations that they will be able to have analyzed at the IITA genotyping lab in Ibadan. Perhaps they are aware that this support will be provided in the future. However, after the ET's interviews with breeders and an IITA director, it did not seem so.

Before the release of the first SIL-based soybean variety, the ET recommends that SIL conducts a critical examination of the seed purification, production, certification (if any), and dissemination entities that are expected to participate in a coordinated effort in each target country. There are various systems of delivery currently in place including using NGOs growing seed, small farmers producing seed for neighbors, and regional seed companies.

Increasing ties between the breeding project lead at the Jimma station and Ethiopian poultry integrators through the help of the Ethiopian USAID Mission is suggested. An example integrator is AgFlow Ventures which manages Mekelle Farms and AgFlow Farms. Mekelle Farms is a poultry farm that supplies improved breeds, inputs, and management methods to a network of entrepreneurial farmers, which they develop into successful, profitable links to rural farmers throughout the country. AgFlow Farms' mission is to build a modern mechanized commercial farm, catalyze the development of a vibrant soybean industry, and supply the animal feed market of the region. A connection to this integrator can be found at www.ethiochicken.com

ANNEX 8.2 SMART Farm Case Study

1. **Partners involved in the product research, development, dissemination, and/or feedback—their roles and inputs. [EQ 1.3]**

The ME has been effective at establishing partnerships that support the SMART farm research trials. An example would be collaboration with research partners Omya and BASF in Ghana. BASF is currently supporting herbicide trials and is also providing personal spray equipment that is being used in pesticide safety training at SMART farm events. Links with development practitioners to promote optimal soybean management practices, however, are limited at present—possibly because the management practices are still being researched and assessed on-station. The SIL SMART Farm manager has participated in ToT programs to ATT and ADVANCE with some of the current focus on pesticide safety. He also conducted ToT programs with MOFA staff and a limited number of farmers in-country. A ToT curriculum and/or an extension guide (e.g., a compilation of extension-type fact sheets) on the technical requirements for soybean production would provide a useful R4D Product for NGO Agronomists, Extension Staff, Agro-input Dealers, and Lead Farmers (see below). There was a good representation of development practitioners and farmers at the Kick-Off Event, but the large number of participants and the way in which the program was organized was such that the Kick-Off was more of a showcasing event rather than an opportunity for effective training or the meaningful dissemination of detailed technical information.

As far as the ET could determine, there is currently no systematic way in which information from farmers' actual experiences in implementation of the management practices promoted by the SMART Farm is being compiled and fed back to the SMART Farm Manager. This feedback loop is essential to ensure that the practices being tested, developed, and promoted by the SMART Farm are appropriate to farmers' needs. Such a feedback mechanism will need to be developed as part of future partnerships with development practitioners, e.g., as part of the mother-baby plots proposed below.

2. **Quality and relevance of the product/technology itself; how can quality/relevance be improved? [EQ 2.1]**

The most impactful output from the SMART Farm has been an increase in seeding rates which resulted in a reduction in hand-weeding by 33 percent during the season. This time-saving information can provide farmers more time for other jobs on the farm, allowing them to make more efficient use of their time. The SMART farm has also demonstrated the ability to increase yields by promoting soil testing for fertility and soil pH, as well as the benefits of adding Rhizobium inoculum with seed at planting. SMART farm staff also determined Phosphorus (P) was a limiting factor for soybean production in Ghana, but P was not widely available in northern Ghana. The SMART Farm Manager alerted local NGOs (i.e., AAT, MOFA) to the problem and eventually the Ministry of Agriculture responded by subsidizing P in 45 counties. Phosphorus is now available and affordable to growers in Ghana thanks to the SMART farm staff and local NGOs.

The SMART Farm is essentially a way of conducting independent, on-station trials[50] and demonstrating optimal integrated management practices, but the relatively small number of sites (three in Ghana, one in Ethiopia)[51] limits the impact of the current approach on development practitioners, extension staff, and farmers. The SMART Farm aims to provide evidence-based guidance on soybean production practices with an outreach component to development practitioners. However, due to the lack of extension activities in the SIL Program, this outreach component has yet to be developed. Additional, associated R4D products that are already emerging and/or could potentially emerge from the SMART Farm approach to promote greater outreach impact include:

[50] The inclusion of private sector partners (as explained above) allows the SMART Farm to provide a platform for the private sector to bring products to smallholder farmers.

[51] Funding for SIL was limited and this number of sites was all that could be afforded.

a. ToT type trainings for technical staff of NGOs and donor-funded projects involved in promoting soybean cultivation;

b. ToT type training for agro-input dealers interesting in selling inputs to farmers (e.g., on safe use of pesticides, "correct" fertilizer/inoculum application, etc.);

c. Research-based agronomic information in the form of technology extension sheets, a compendium of extension sheets, or an extension-type manual suitable for use by development partners, extension workers, and soybean farmer organizations;

d. Technology extension sheets or guidelines on the necessary inputs, their handling, and safe use for use by agro-input dealers (who also play an important role in educating farmers at point of sale);

e. Mother-baby demonstration plots in farm communities and feedback mechanisms that can be implemented in partnership with NGOs, government extension agents, and/or donor-funded development projects;

f. Policy-relevant briefings or fact sheets on the inputs necessary for soybean production which should be targeted at government decision-makers and private sector input suppliers (i.e., importers and distributors), as well as NGOs and civil society organizations (e.g., National Farmers Unions or Associations) involved in advocacy for policy reform in the agricultural sector; and

g. Soil testing guideline, possibly working with GreenEF to develop a guide that can be used by organizations similar to GreenEF.

3. How it was disseminated; how could dissemination be improved? [EQ 2.2]

SIL has promoted research at SMART Farms through events such as the Soybean Kick-off Event where the information is shared with local partners and lead farmers. SMART Farms have also been highlighted in SIL newsletters, videos, and webcasts, as well as a recent fact sheet.

To help promote best management practices among farmers, development partners expressed the need for extension information for use in developing the content for dissemination to farmers. The different development partners that the ET interviewed each have their own extension approach, e.g., Talking Books, Digital Classrooms (using Pica Projectors to screen farmer participatory videos), Learning Centers (0.5 ha demo plot), etc. The NGO's technical staff work with partner communication specialists and extension agents to develop audio recordings, videos, design demo plots, etc. The NGO's technical staff and extension agents need to have knowledge about the most appropriate soybean cultivation methods to ensure that the messaging in their extension products is technically sound and that their demo plots are designed appropriately. The ET recommend that the SMART Farm team should become more systematically involved in: 1) delivering ToT type training to technical staff of NGOs and donor-funded projects involved in promoting soybean cultivation; 2) providing research-based agronomic information in the form of technology fact sheets, a compendium of fact sheets, or an extension-type manual suitable for use by development partners, extension workers, and soybean farmer organizations; and 3) working in partnership with NGOs and development projects that are promoting soybeans to train staff in the design of on-farm demonstration plots, potentially using a mother-baby approach in which the "mother" plot is an on-station SMART Farm which is used as a training location/ demonstration plot for a series of on-farm "baby" plots managed by the NGO/project extension agents. Having an extension component to SIL 2.0 would enhance the SMART farm program's ability to provide deliverables to their target audience. By incorporating a feedback loop into the design of the baby plots (so that the extension agent or NGO is required to report on experiences and results from the on-farm baby plots and the farmers involved), then SIL researchers can compile and analyze data on the on-farm application of specific recommendations and make adaptations to local conditions where necessary.

4. **Potential for sustainability/to achieve development impacts. [EQ 2.1]**

According to the PI, the most impactful output from this RMA to date has involved increasing soybean seeding rates which has resulted in reducing hand-weeding by 33 percent during the growing season. This would potentially allow more time for farmers to focus on other tasks on the farm, increasing their efficiency and making them more productive. The SMART Farm program has helped increased soybean yields by promoting soil testing for fertility and soil pH issues. Currently, the fertility/additive-based component research conducted on these farms promotes cultural practices such as adding phosphorus and Rhizobium inoculum at planting to improve soybean yields.

To make these impacts sustainable, a long-term educational program needs to be developed in collaboration with the SMART Farm team and led primarily by agricultural practitioners (NGOs and/or the extension system), and incorporating lead farmers in the region. Promotion of these beneficial farm practices needs to be continued at research centers (i.e., SARI), but also demonstrated in-country through on-farm tests. These educational demonstration tests need to be supported by the distribution of extension materials to the target audience that outline how to use these best management practices. The Deputy Director of SARI made a suggestion of setting up SMART Farms in areas of the country where farmers are centralized: “Bring the research to the farming community versus the other way around.”

5. **Ways in which capacity was developed through the development and application of the product/technology—either individual capacity and/or institutional capacity. [EQ 2.3, EQ 3.1]**

The SMART Farm Manager alerted local development practitioners (i.e., AAT, MOFA) to the problem of unavailable sources of phosphorus in Ghana. Eventually, the Ministry of Agriculture was made aware of this issue and responded by subsidizing Phosphorus in 45 counties. Phosphorus is now affordable to growers in Ghana. It is quite likely that similar lack of availability of P exists in other countries, suggesting that briefings or fact sheets suitable for government decision-makers and private sector input suppliers, as well as advocacy materials for use by NGOs working in the agricultural sector might be a useful additional R4D product.

With greater emphasis on training, dissemination, and extension, the SMART Farm approach has the potential to increase the knowledge (capacity) of NGOs, extension agents, agro-input dealers, and farmers and thus strengthen the capacity of the Ghanaian agricultural community to produce a better-quality soybean with an increased yield potential.

6. **Research challenges and how they were dealt with. [EQ2.4]**

The biggest challenge to the SMART farm program was addressing the soil fertility issues in Ghana. The team realized early on that Phosphorus was a limiting factor to soybean production in northern Ghana. Phosphorus deficiency plus the preponderance of acidic soils made soil fertility and soil testing the main focus of the SMART Farm product.

Research trials conducted at the SMART Farm have shown the benefit of promoting soil testing and proper soil pH, as well as the advantages of adding Rhizobium inoculum with seed at planting.

The ME expanded beyond scope of the original SIL proposal by establishing a SMART Farm in Ethiopia in 2017. This brought a new challenge in that there was no one in Ethiopia dedicated to the SMART Farm program. However, SIL’s partner, the JARC of EIAR, has risen to the occasion and actually expanded on the component research started at SARI in Ghana by adding different soybean varieties to the test. JARC has also involved a broader range of researchers in the SMART farm design, e.g. a soil scientist, agronomist, economist, extensionist, plant breeder, etc.

7. **Future investments required. [EQ 4.1]**

Future focus for the SMART Farm would include continued research on soil health, fertility, and soybean seed quality elements of soybean production. There is also a need for a cost/benefit economic analysis of the component research currently being conducted by the SMART Farms in both Ghana and Ethiopia.

An increase in the number of local cooperators and private sector partners would improve dissemination of the product. Adding an extension component to SIL 2.0 would also enhance the SMART program by allowing greater dissemination of the research product and support for development of extension-type activities and products.

The addition of a tractor at the SARI location in Ghana would be useful in demonstrating the benefits of mechanization. Plus, with the program expanding to Ethiopia, there will be a need for more resources for this location.

The ET suggests the addition of a soil scientist, either from the U.S. or within Africa, to join the MRA to assist in the soil fertility project. Cross-MRA interactions between the SMART team and those focused on increased mechanization would also improve exposure of both programs within the country. Greater awareness of the environmental issues related to soybean production and the use of chemical inputs could also be promoted through collaboration with MRA 9. The ET also suggests that the SMART Farm should continue “as-is” but that on-farm demonstrations should be incorporated into the program in areas of the country where farmers are centralized to increase dissemination of the product and to display the benefits of the research being conducted by the MRA.

ANNEX 8.3 Case Study of Products from MRA 5: Utilization for Human Nutrition

Rather than looking at a single product, this case study includes the four products developed by the SIL Nutrition Team. The study also includes the Soy Foods Bazaar which—strictly speaking—is not an R4D product but could easily be implemented by development partners and provides an excellent opportunity to kick-start various in-country research and dissemination activities, depending on how it is developed.

Product	Description
Soy Utilization Training Course	ToT for intensive village-level trainings and workshops focused on soy processing, soy nutrition, and soy integration into local cooking applications through interactive and hands-on workshops.
Soy Food Entrepreneur Network	Network to connect soy dairy operations throughout Africa to enable entrepreneurs the ability to share their experience, business practices, training, and technological knowledge.
Recipe Database	First-ever compilation of international soy food recipes. Recipes can be easily replicated at the village-level and are useful for inclusion in institutional feeding programs like school lunch programs and in daycare and hospital settings.
Soy-fortified Complementary & Weaning Foods	Soy-based complementary food that combines soy and orange-fleshed sweet potato.
Soy Foods Bazaar	Dissemination, networking, and awareness-raising event that includes booths to promote soy-food entrepreneurs and chefs' cooking competition.

Partners involved in the product research and development, their roles, and inputs

Product	Partners Involved
Soy Utilization Training Course	Developed by SIL researchers and tested in Mozambique; course curriculum was co-designed with AgDiv Project and ToT training conducted for AgDiv trainers. AgDiv trainers have since implemented the training course at the village level in Malawi.
Entrepreneur Network	Network members include over 30 entrepreneurs from 10 countries. SIL works with Malnutrition Matters (Canadian NGO) on soy cow production techniques. Soy cow entrepreneurs at selected research institutes (SARI, FRI) act as training centers for other network members.
Recipe Database	Recipes have been contributed by Network members, SIL partners, and other practitioners. SIL stakeholders are regularly invited to try out the recipes and to provide feedback.
Weaning Foods	University of Development Studies (Ghana) is leading this research with funding for fieldwork from SIL through CRS.
Soy Foods Bazaar	2017 Bazaar was organized by CRS. Included: presentations and booths displayed by Network members and other soy food entrepreneurs, WFP, Ministry of Tourism. Competing chefs came from local restaurants and hotels. Participants included students from local catering college.

Quality and relevance of the product/technology itself

Product	Quality and Relevance
Soy Utilization Training Course	The course curriculum that was co-designed with AgDiv Project would be highly relevant to the AgDiv Project and the situation in Malawi.
Entrepreneur Network	All Network members interviewed said that the Bazaar provides good networking opportunities.
Recipe Database	No data on quality/relevance collected for this product.
Weaning Foods	Weaning foods have been tested for acceptance among mothers and babies.
Soy Foods Bazaar	The "edutainment" approach of the Ghana 2017 Bazaar was enjoyed by the participants. All Network members interviewed said that the Bazaar provides good networking opportunities. The stakeholder mapping exercise undertaken for the Ethiopia 2017 Bazaar ensured that the right participants were invited.

How it was disseminated and used

Product	Dissemination and Use
Soy Utilization Training Course	Initially developed and tested in Mozambique, the course was then taken up by the AgDiv Project in Malawi which will train up to 3000 rural households.
Entrepreneur Network	The Network is used by its members for knowledge sharing and capacity development.
Recipe Database	Recipes are freely available on the SIL website and regularly shared in the Weekly Digests. There is potential for additional dissemination channels and uptake by development practitioners through compilation of recipe books suitable for specific regions/audiences.
Weaning Foods	Results from taste acceptability are still being prepared by PIs. There are plans to produce journal articles, conference proceedings, and presentations at SIL events such as a kick-off class, food bazaar, etc. to influence policymakers through WFP and Ghana Health Service and to have an effect on household food recommendations.
Soy Foods Bazaar	The bazaar itself is a dissemination event. Additional dissemination was made through local TV coverage. Further dissemination could be done through social media.

Potential for sustainability/to achieve development impacts

Product	Potential to Achieve Impact
Soy Utilization Training Course	High: The course can be implemented through large-scale development projects and has the potential to train (through ToT) and promote utilization among thousands of rural households, leading to increased and sustained adoption of soybean cultivation among rural households, as well as increased consumption of soy food products.
Entrepreneur Network	Membership is relatively small and focused on soy cow entrepreneurs. It can be increased to achieve knowledge sharing among more soy food entrepreneurs, increase production and consumption of soy products, increase incomes of entrepreneurs, and increase demand for soybean grain.
Recipe Database	Provides ideas and recipes for soy-producing households, entrepreneurs, chefs, and institutions (e.g., schools, daycare centers, hospitals, etc.). It can potentially lead to improved soy food products and dishes and increased consumption of soy.
Weaning Foods	If adopted by rural households, weaning foods can potentially enhance nutrition in the first 1000 days in areas where soy is cultivated. If adopted commercially, weaning foods can potentially have greater geographical impact, e.g., SIL is developing links with Sun Seed Oil/CP Feeds in Malawi, a private sector company interested in processing soy for complementary foods for sale to WFP.

Product	Potential to Achieve Impact
Soy Foods Bazaar	Creates awareness about soy food products among chefs, students, and other consumers. It has the potential to increase soy food consumption. Networking by soy food entrepreneurs and other value chain actors can potentially lead to improved marketing and sales of soy food products. Value chain development could be further strengthened if Bazaar was used to launch a Soy Foods Innovation Platform (as an additional R4D product).

Ways in which capacity was developed through the development and application of the product/technology

Product	Capacity Development
Soy Utilization Training Course	Capacity of implementing organizations, individual trainers, and course participants is enhanced through training.
Entrepreneur Network	Capacity of Network members is enhanced through knowledge sharing and testing of new techniques by individual members.
Recipe Database	Capacity of individuals who use recipes is enhanced.
Weaning Foods	Capacity of researcher and students involved in development and testing of weaning foods is enhanced through interactions with SIL researchers. Additional capacity development if weaning foods are promoted by WFP, Ministry of Health, etc. and are adopted by households and/or commercial companies.
Soy Foods Bazaar	Capacity of participants increased through increased awareness of soy food products; capacity of entrepreneurs increased through networking.

Research challenges and how they were dealt with

Product	Challenges
Soy Utilization Training Course	No challenges were reported by KIs.
Entrepreneur Network	All Soy Cow Entrepreneurs interviewed experienced various challenges, including funding necessary to meet FDA hygiene requirements (SARI Soy Cow)—SIL supported funding application, though unsuccessful; marketing challenges, and lack of profitability—SIL and Network members continue to address these issues through the marketing webinar and techniques to increase the shelf life of soy milk.
Recipe Database	No challenges were reported by KIs.
Weaning Foods	Aflatoxin is a major problem in groundnuts and maize (but not soy); there is risk of contamination when these products are used in complementary food mixtures. Another Illinois researcher has developed testing method and there is potential to link up with this program technology.
Soy Foods Bazaar	No challenges were reported by KIs.

Future investments required

Product	Future Investments
Soy Utilization Training Course	Further promotion of course to encourage additional uptake by development partners.
Entrepreneur Network	Potential to expand the Network membership and activities. A review of the literature on knowledge sharing networks might identify ways in which the Network could be more effective.
Recipe Database	This is a low-cost product that can potentially be re-packaged (e.g., as a recipe book—either by SIL or by development partners) and promoted for greater impact; however, there is a need to understand what kind of demand for recipes exists.

Product	Future Investments
Weaning Foods	There are plans to expand the complementary foods to include fruits, e.g., orange-fleshed banana (with Bioversity). There is a need for robust evidence of nutritional benefits of soy, as well as briefing papers targeting policymakers and practitioners.
Soy Foods Bazaar	Bazaar has the potential to become an R4D product, depending on how it is developed, e.g., as an awareness-raising event that can be implemented by development partners at various levels (e.g., in rural communities, at the district, regional level, or national level) to initiate a Soy Foods Innovation Platform for value chain development; etc.

ANNEX 8.4 Soybean Success Kits Case Study

For smallholder farmers in sub-Saharan Africa, soybean crop yield can make the difference between subsistence and actual profit. Developing ways to increase yields and improve overall crop performance is essential for these farmers to stay committed to the crop. Improving yields can be achieved through a number of different approaches, which vary from region to region based on the resources available, quality of the growing environment, agronomic practices, and cultural and socio-economic norms. To address some of these issues, SIL has developed the "Soybean Success Kit."

Soybean Success Kits contain 2.5 kilos of locally produced soybean seed, 2 kilos of fertilizer, and a bag of inoculant, as well as pictorial instructions on inoculating, planting, and harvest printed on the soybean success kit bags. Also included in the kits is a small bag of sugar for making a sticky solution for use in mixing the seed and inoculant. As such, the kits are a complete package directed for soybean production containing all needed inputs and educational training to grow soybeans for smallholder farmers.

The concept of the kit was initially developed to ensure that farmers taking part in a soybean uptake survey had experience in growing soybeans along with the necessary inputs. Kits were distributed to farmers who were then later interviewed for the Soybean Uptake and Network Survey (SUNS). The kits are also seen as a useful way of introducing farmers to the inputs needed for successful soybean cultivation, particularly since these inputs (improved seed, inoculum, phosphorus) are often not readily available in rural areas. The assumption is that as farmers begin to realize the value of these inputs, the demand for these inputs will increase, and private sector suppliers will begin to provide them.

1. **Partners involved in the product research, development, dissemination, and/or feedback—their roles and inputs. [EQ 1.3]**

SIL collaborated with CRS, SARI, the Ghanaian Ministry of Agriculture, and the Mozambique Institute for Agricultural Research (IIAM). The SIL team in coordination with their partners assembled and distributed 4,800 soybean success kits to farmers in villages in 2015 and 2016. Approximately 2,400 kits were distributed in each country during this time.

SIL is working within communities identified by the USAID Resiliency in Northern Ghana (RING) project, implemented by Global Communities and designed to contribute to the Government of Ghana's efforts to sustainability reduce poverty and improve the nutritional status of vulnerable populations in 17 districts of in the Northern Region of Ghana.

In 2017 CRS and USAID-ATT took the lead on distribution of the kits in Ghana. The groups offered vouchers for the kits, as well as soil tests. This was to provide linkages between the farmers and the agro dealers where farmers would submit the vouchers in exchange for the products. No kits were distributed in Mozambique in 2017 due to internal strife within the country.

2. **Quality and relevance of the product/technology itself; how can quality/relevance be improved? [EQ 2.1]**

The Soybean Success Kits are designed to demonstrate the value of high quality seed and inputs. Farmers using the kits saw soybean yields more than double from 1,000 Kg/ha to 2,300 Kg /ha. This demonstrates that with the correct inputs and training on appropriate agronomic practices, smallholder farmers can drastically increase their crop yields and, in turn, their income.

The success kits are designed to be an all-in-one crop improvement tool for soybeans for small holder farmers. The kit bundles inputs for soybean production that can be difficult to access because of supply or distance to markets, or access to input dealers and sales agents in smallholder farm communities. The inputs put in the kits improve soybean yields by focusing on soil health, high-quality seed, and appropriate agronomic practices (including proper row spacing and planting density) as compared to traditional methods.

If inputs are not seen as necessary for good crop production practices, yield will remain low and smallholder farms will continue to struggle the feed themselves. Packaging inputs together show the importance of each component in a growing system—good seed, fertilizer, inoculant for legumes, and knowledge on how to best grow and store the crop are all qualities vital to improve yields. This effort could allow soybean production to get a foot-hold in Ghana and possibly other Feed-the-Future countries.

The fact sheet states that the kits are "designed to penetrate the market,"[52] yet it is not made clear how this market penetration will be realized.

3. **How it was disseminated; how could dissemination be improved? [EQ 2.2]**

Recipients of the kits also received training on soybean agronomy and, in some villages, extension training on soybean nutrition and human utilization. In each village SIL researchers provided a demonstration on how to inoculate soybeans. It was vital that the kits contain extension communications so that fertilizer and inoculant are properly used and best able to bring about positive impact in yield increases.

In 2017, the distribution of the kits in Ghana involved vouchers rather than the direct distribution. SIL researchers regard this change in the distribution mechanism as a serious mistake, yet it is likely that the NGO had intended to stimulate input markets by promoting linkages between the farmers and the agro dealers where farmers would submit the vouchers in exchange for the products. Vouchers for soil testing were also made available. The idea behind the vouchers is to stimulate the private sector to supply and distribute the inputs to farmers. This appears to be an innovation that the development practitioners have developed to promote market penetration, but further follow up is required.

4. **Potential for sustainability/to achieve development impacts. [EQ 2.1]**

The long-term aim of the kits is to raise more awareness in the farming communities, which can drive demand for these inputs. The private sector can then play a critical role in fulfilling these demands.

Hopefully, the increased knowledge and yields provided by the success kits will help drive consumer demand for inoculants and fertilizers. Low-level knowledge about inputs amongst smallholder farmers can lead to low yields. Demand is actually based on the customer knowing that the product exists and is required for good yields. Using success kits helps sensitize smallholder farmers to all of the components of successful production system.

The Extension system does not function well in Ghana, partially due to the lack of support by the government. NGOs are filling the gap as with CRS and the seed starter kits. Commercial partners are the best bet for success as they are more sustainable compared to the extension system. Seed starter kits will be helpful in increasing soybean production in Ghana, but only if private partners/commercial entities get fully involved.

5. **Ways in which capacity was developed through the development and application of the product/technology—either individual capacity and/or institutional capacity. [EQ 2.3, EQ 3.1]**

Capacity was developed to some degree at the practitioner level with the success kit product. CRS and USAID-ATT took the lead in scaling-up production and distribution of the kits in Ghana in 2017. However, the shift from direct distribution to a voucher-based system suggests that the NGO partners failed to fully understand the primary purpose of the kits in ensuring that farmers received all the necessary inputs for successful soybean production. While SIL recognizes the need to involve the private sector in the supply of the kits, a clear model through which to achieve this has yet to be developed and tested with the NGO partners. The NGO partners appeared to "jump the gun" by involving the private sector in way that was not consistent to the assumptions that had been made by SIL (as above). This

[52] http://soybeaninnovationlab.illinois.edu/sites/soybeaninnovationlab.illinois.edu/files/Soybean%20Success%20Kits_0.pdf

experience suggests that: 1) more capacity development is needed among NGO partners; and 2) SIL needs to develop a model that clearly lays out the role of the private sector in the distribution of the kits and how linkages between farmers and private sector input dealers will be developed and sustained. Such a model that could be implemented by agencies focused on ramping-up soybean production in other Feed-the-Future countries.

6. **Research challenges and how they were dealt with. [EQ2.4]**

More starter kits could have been distributed in 2016, but a lack of funds limited the numbered they could be prepared by the SIL team. The lack of discretionary funds in SIL 1.0 could not adjust to situations that arose on the ground in-country. In this case there was not enough funding to expand the program. SIL management is aware of this problem and will address the issue in SIL 2.0.

The SIL team identified that some growers did not fully understand what the supplies that came in the kits were for, which resulted in fertilizer or inoculant not being utilized with the soybean seed. The SIL team addressed this by adding drawings/pictures to the side of the bag of starter kits. These easy-to-follow directions reduced improper handling of the kits and helped alleviate problems that can arise when farmers are working with an unfamiliar crop.

There have been some errors by CRS in 2017 in preparing starting kits. In one case, the individuals forgot to add inoculum to the kit, which resulted in a poor crop for those farmers who used these incomplete packages. As practitioners/seed dealers become more familiar with soybeans, these types of problems will be minimized. Also, as farmers become more familiar with the kits, they will be able to identify and point out these types of errors.

Soybean is a new crop for almost all of the people involved, so there will be errors along that should be minimized with time. There should come a point where starter kits will not be necessary, as grower work directly with seed dealers to purchase the supplies they need for soybean production.

7. **Future investments required. [EQ 4.1]**

Seed starter kits will continue to push soybeans into new areas. There will be a need for extension activities to support the local farm community with this new crop. Educational material needed to be developed and more ToT programs need to be conducted to meet this demand.

Educational activities need to focus on seed dealers and agro-input suppliers to push them to develop their own seed starter kits. This is a key link that will drive the soybean industry in Ghana. More funds will be needed in SIL 2.0 for this purpose.

ANNEX 8.5 Case Study of the Field Guide to Soybean Diseases and Pests

The purpose of the soybean disease guide is to provide soybean breeders, growers, agronomists, consultants, and others a way to diagnose soybean diseases in the field. The guide highlights diseases commonly found in many soybeans production areas of the World, as well as those that may be unique to Africa. The guide contains a brief introduction on soybean production and a description of about 20 plant diseases with both images and text. The guide is available for download from the Soybean Innovation Lab (SIL) home page at: http://soybeaninnovationlab.illinois.edu/soybean-disease-diagnsotic-guide

1. **Partners involved:** The researcher collaborated with SIL to develop the diagnostic guide for the identification of soybean diseases and pests specifically designed for use in Africa. The SIL Communication Director assisted with the designing the guide. There was no partner involvement in the development of this publication.
2. **Quality and relevance of the guide:** This guide is relevant and appropriate for Feed the Future countries and will be very useful in the hands of plant breeders, practitioners, and smallholder farmers. This publication should have significant impact by allowing individuals to correctly identify plant disease disorders in their fields so that they might be able to react with proper control measures to maintain yields and seed quality.

   One shortcoming of the guide is the lack of disease management options offered to actually control the diseases highlighted in the guide. Once a farmer or field practitioner identifies a disease in the field, they need to know how best to respond to the situation. There are reportedly few options available for smallholder farmers for disease management in Ghana, but more thought could have gone into expanding this section. The addition of information and images on weed and insect pest management would make the guide much more useful as weeds and insects can be just as troublesome as plant diseases in soybean production.
3. **How was it disseminated; how could dissemination be improved?** The guide was highlighted on a SIL webcast in September. The guide is available for download from the SIL home page at: http://soybeaninnovationlab.illinois.edu/soybean-disease-diagnsotic-guide. One can assume that it was highlighted in the SIL Newsletter.

   Presentations on pest (disease) management in-country at soybean kickoff events and other educational meetings where practitioners and/or farmers are present would be an excellent way to disseminate this type of information. Obviously, having hard copies of the guide available for distribution at these events would be helpful. Hard copies should also be made available to SIL staff or partners to distribute to agricultural professionals or farmers they meet in one-on-one situations and not only in a formal "group" settings. A hard copy of this guide needs to get into the hands of all interested parties.
4. **Potential for sustainability/to achieve development impacts?** Plant disease management is an important factor in developing a successful soybean production system. This guide will be a useful for practitioners in host countries in diagnosing plant diseases. As soybean production increases in these countries, plant diseases and other disorders will become more and more of an issue. This guide will benefit those in need of trouble-shooting problems in field situations.
5. **Ways in which capacity was developed through the development and application of the product/technology—either individual capacity or institutional capacity.** The guide is a good example of SIL researchers identifying technical capacity needs of the host countries by individual soybean breeders, agronomists, practitioners, and farmers. There is an obvious thirst in-country for this type of extension information. Hopefully this will be the first of many such extension products produced by SIL.

6. **Research challenges and how they were dealt with:** This did not appear to be a SIL product that faced many challenges. One concern shared by the researcher was that most of the images used in the guide were taken in other countries outside of Africa. However, this is not a major issue as plant diseases of soybeans in Africa typically produce the same symptoms as the same disease on soybeans in the U.S. It seems likely that the guide will eventually be updated and will include more images of plant diseases that appear in soybean fields in Africa.
7. **Future investments required:** It is possible that future investments may be required in printing costs if SIL wants to produce hard copies of the guide for distribution. It is also recommended that the guide should be expanded to include weed and insect pests.

ANNEX 9. ONLINE SURVEY RESULTS

Online Survey Results		
Q1 What is your institutional affiliation with regard to your SIL activities?		
Affiliation	**%**	**Actual # Count**
National Agricultural Research Institute	20.0%	7
International Agricultural Research Institute	5.71%	2
Africa-based university or academic institute	2.86%	1
U.S.-based university or academic institute	40.00%	14
Local NGO or civil society organization	0.00%	0
International NGO, Foundation	8.57	3
Private sector company	5.71%	2
Donor organization	8.57%	3
Other	8.57%	3
TOTAL	**100%**	**35**
Q3 Indicate country in which you are mainly conducting SIL activities (if regional, check all relevant countries).		
Countries	**%**	**Actual # Count**
Ethiopia	10.61%	7
Ghana	31.82%	21
Kenya	6.06%	4
Malawi	7.58%	5
Mozambique	13.64%	9
Tanzania	4.55%	3
United States	13.64%	9
Zambia	6.06%	4
Other	6.06%	4
TOTAL	**100%**	**66**

Q7 Program Management: Please rate on scale 1 to 4, where 1=poor, 2=average, 3=good, and 4=excellent. Select N.A. if the question is not applicable to your situation.						
Question	**1**	**2**	**3**	**4**	**N.A.**	**Total**
Rate the effectiveness of the SIL ME in implementing and managing SIL's research activities	0	8.57%	20.0%	68.57%	2.86%	35
Rate the effectiveness of the SIL ME in implementing and managing SIL's training activities	0	5.71%	28.57%	51.43%	14.29%	35
Rate the effectiveness of the SIL ME in disseminating information regarding SIL activities to stakeholders?	0	2.86%	11.43%	85.71%	0	35
Rate the effectiveness of the SIL ME communicating/ coordinating to achieve project goals/objectives	0	2.86%	20.0%	77.14%	0	35
Rate the effectiveness of the SIL ME in communicating/coordinating to carry out a shared research agenda	0	5.71%	22.86%	65.71%	.71%	35
Rate the effectiveness of the SIL ME in communicating/ coordinating to improve capacity of local researchers	0	8.57%	22.86%	57.14%	11.43%	35

Online Survey Results						
Rate the effectiveness of the SIL ME in establishing partnerships with other partners/sectors to help achieve its goals and objectives	0	2.86%	17.14%	80.0%	0	35
Q8 Research and Training Program: Please rate on scale 1 to 4, where 1=poor, 2=average, 3=good, and 4=excellent. Select N.A. if the question is not applicable to your situation.						
Question	**1**	**2**	**3**	**4**	**N.A.**	**Total**
How effective was SIL in generating quality research products?	0	14.29%	40.0%	40.0%	5.71%	35
How effective was SIL in developing products that practitioners will use?	0	11.43%	37.14%	48.57%	2.86%	35
How well has the program identified and addressed capacity needs of host stakeholders?	2.87%	14.29%	25.71%	45.71%	11.43%	35
How proactive was SIL in responding to research challenges & expanding beyond scope of original proposal?	2.86%	11.43%	22.86%	54.29%	8.57%	35
How has SIL performed in establishing collaborations with partners	0	0	40.0%	60.0%	0	35
Q9 Program Future: If there was to be second phase of SIL with continued funding, how effectively do you feel that the SIL Program would be able to perform in moving forward in the following priority areas. Please rate on scale 1 to 4, where 1=poor, 2=average, 3=good, and 4=excellent. Select N.A. if the question is not applicable to your situation.						
Priority area	**1**	**2**	**3**	**4**	**N.A.**	**Total**
Technical research	0	2.86%	20.0%	74.29%	2.86%	35
Capacity building	0	8.57%	34.29%	57.14%	0	35
Institutional support to partners	0	2.86%	28.57%	65.71%	2.86%	35
Dissemination of knowledge of products	0	0	25.71%	74.29%	0	35