



FEED THE FUTURE

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



INNOVATION LAB FOR COLLABORATIVE RESEARCH ON SUSTAINABLE INTENSIFICATION

FY 2020 SEMI-ANNUAL REPORT



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KANSAS STATE UNIVERSITY

Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification (SIIL)

FY 2020 Semi-Annual Report

This semi-annual performance report for FY 2020 is made possible by the generous support of the American people through the United States Agency of International Development (USAID). The contents are the responsibility of Kansas State University and do not necessarily reflect the views of USAID or the United States Government.

Program activities are funded by the United States Agency for International Development (USAID) under Cooperative Agreement No. AID-OAA-L-14-00006.

Cover Photos

Top left: Paddy harvesting operations using Mini combine harvester and ACI reaper in Wazirpur, Barishal, Bangladesh, November 2018. *Photo credit: Kamrul Hasan.*

Top right: Comparison of paddy field that had used a direct seeder versus a broadcast seeder in Battambang, Cambodia, October 2018. *Photo credit: Saruth Chan.*

Bottom left: Ms. Channaty Ngang, MS student of University of Battambang, poses next to here successfully grafted tomato plant in Battambang, Cambodia, February 2018. *Photo credit: Rickey Bates.*

Bottom right: Local women participated in a training over properly processing millet grain. Diokoul Diawrigne, Senegal, December 2018. *Photo credit: Dieye Bineta.*



I. Research Progress Summary

A. Research progress made during the reporting period

I. Management Entity (ME) Operations

- a. The Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification (SIIL) continued to support existing subawards and consortia with no-cost extensions through March and June 2020, respectively. All subaward have developed transition plans outlining how they will ensure that their research will continue to be supported and integrated with other research programs in the country or region past the end date of their awards. Results from these plans will be highlighted in SIIL's Five-Year Report available in June 2020.
- b. Select projects that strengthen SIIL's research portfolio were invited to submit a concept note informed and built on their previous research achievements, and designed to address the suitability, scalability, and sustainability of the technologies developed by their projects. Following the evaluation of the concept notes, full proposals were requested and are under review with the anticipation of implementation in June/July 2020. Research projects will build on the achievements of the past four years while ensuring the continued relevance of the research, and aligning with the SIIL's renewed focus on supporting local responsibility and accountability. The SIIL will lean towards a regional approach to enhance coordination as well as scaling and adoption of appropriate technologies, and contributions to the [U.S. Government's Global Food Security Research Strategy \(GFSRS\)](#).
- c. The development and implementation of the iREACH (Innovation, Research, Extension and Advisory Coordination Hub) initiative in West Africa (WA) is underway. USAID's West Africa Regional mission and the Bureau for Resilience and Food Security, the West and Central African Council for Agricultural Research and Development/Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles (CORAF), and SIIL participated in a co-creation process in December 2019 to finalize the governance structure and funding. The iREACH pilot will initially focus on USAID's activities in Feed the Future and Resilience Zones in Senegal, Ghana, Mali, Burkina Faso and Niger. The objectives are to: a) improve coordination, alignment and integration of relevant activities; b) create and strengthen technology parks and facilitate effective flow of information and innovations, and; c) build human and institutional capacity. To signify the commitment and collaboration between Kansas State University/SIIL and CORAF, a Memorandum of Understanding (MOU) was signed between both entities.
- d. SIIL participated in and supported the 6th International Soil and Water Assessment Tool (SWAT) Southeast Asia conference held in Siem Reap, Cambodia in October 2020. In addition, SIIL conducted site visits and capacity building activities to support the financial and monitoring and evaluation needs of the Royal University of Agriculture (RUA) and CE SAIN staff, as well as participating in the American Soybean Association (ASA) – Commercialization of Aquaculture for Sustainable Trade (CAST) project's partnership meeting. In January, the SIIL ME returned to Cambodia to highlight CE SAIN's accomplishments, Agriculture Technology Parks and newly renovated fish ponds. Participants included the USAID Cambodia Mission and the Cambodia U.S. Ambassador, Patrick Murphy in Kampong Thom.
- e. SIIL conducted a capacity building event with Peace Corps Senegal in December 2019 during their annual Master Farmer Conference in Thies. Members of the SIIL ME presented on farming systems, participatory engagement, and communication skills for the Peace Corps volunteers and staff, as well as local Institut Sénégalais de Recherches Agricoles (ISRA) staff and students.
- f. As a result of the collaboration and network from the SIIL/ISRA/Peace Corps partnership, one of the Senegalese women, Fatou Tine, who is finishing her PhD, was hired by Peace Corps Senegal as an Agriculture Program and Training Specialist to help prepare agriculture Peace Corps volunteers to work in their communities.
- g. SIIL hired a new International Communications Specialist, Layne Wilson, who started in March 2020 to support our communication, knowledge sharing and dissemination efforts.

2. Geospatial and Farming Systems Research Consortium (GFC)

- a. Data analysis in two target countries – Senegal and Cambodia – was completed during their three-month no-cost extension, and twenty-four total data sets from their research were uploaded into the SIIL Dataverse.
- b. Between 2014 and 2019, the GFC designed and launched more than 25 collaborative projects, the majority of which have been completed, including an open-access satellite database of cropland locations (<https://geosurvey.qed.ai/about/>), high spatial resolution information on crop growing areas in Tanzania, Bangladesh and Cambodia, and the global WorldClim platform (<http://worldclim.org/version2>).
- c. Seven publications and presentations on the consortium's research activities were produced during the reporting period.
- d. Installation and training was completed on 11 total weather stations in Senegal (6) and Cambodia (5), which will be used to collect weather data for modeling purposes.
- e. UAV training was conducted in Cambodia and Senegal for remote-sensing data collection, and websites were created to aid with UAV flight planning (<https://gfc.ucdavis.edu/guides/flightops/index.html>) and to collect post-flight data (https://gfc.ucdavis.edu/guides/qgis_lab.html).
- f. This consortium will be completed March 2020 and is in the process of being closed out. Full results from the consortium will be highlighted in the SIIL Five-Year Report available in June 2020.

3. Appropriate Scale Mechanization Consortium (ASMC)

- a. Appropriate Scale Mechanization Innovation Hub – Bangladesh (ASMIH-Bangladesh)
 - i. Three leaflets on the power tiller operated seeder, bed planter, and axial flow pump have been printed and distributed to farmers, mechanics, operators and at the machinery fair as instruction materials.
 - ii. GIS maps for finding accessible harvesting technologies, rice transplanters and conservation machines were generated for four villages in the intervention areas. GIS coordinates and spatial data to identify and select suitable land for mechanical transplanting and harvesting in Boro and Aman seasons were collected and a GIS-based map of Baratia, Khulna and Holdibaria, Patuakhali were prepared.
 - iii. Two different models of small- to medium-sized combine harvesters were tested in limited areas in Netrakona and Tangail and found suitable for harvesting from both technical and financial points of view.
 - iv. Three research articles on conservation agriculture, harvesting, and transplanting technologies have been published in various peer-reviewed journals, and two research articles on harvesting technologies have been accepted by academic journals. Additionally, three presentations were given at international conferences.
- b. Appropriate Scale Mechanization Innovation Hub – Burkina Faso (ASMIH-Burkina Faso)
 - i. A fabrication training session was held November 18-22, 2019, at the Hub demonstration site in Koumbia. The prototype of an improved planter and chopper were created in accordance with local farmers' and blacksmiths' input, Tillers International and Michigan State University.
 - ii. A farmer training sessions on oxen nutrition and health was organized by Dr. Vinsoun Millogo and Michel Kéré in four different locations in the Hauts-Bassins Region. In total, 428 farmers were trained, with 58 women and 370 men participating.
 - iii. An advisory committee meeting was held November 13-15, 2019 at Nazi-Boni University. The last four years of the ASMC project were evaluated by the committee with the participation of project stakeholders (farmers, students, researchers, technicians, and institutions). In total, 72 participants attended different sessions, with 7 women and 65 men. Three main innovations, a planting system, animal feeding system tools and a drip irrigation system were discussed, and women especially liked the planting system as they could now spend more time doing other tasks on their farms. The main highlight that women reported was that "We can breathe now!"

- c. Appropriate Scale Mechanization Innovation Hub – Cambodia (ASMIH-Cambodia)
 - i. Training of trainers for internship program in partnership with Swisscontact to build capacity of faculty and staff on skills such as Business Management, Marketing Strategy, and Soft Skills in order to provide instruction to the selected interns.
 - ii. Completed data collection for test of modified no-till seeder and broadcast seeder designed for four-wheel tractors with the participation of farmers in Battambang and students from RUA.
 - iii. A handbook for extension experts titled "Not New, but Modern - Conservation Agriculture for Commercial Vegetable Home Gardens and Supporting Hand Tools" is being completed.
 - iv. The GoNative App is currently being designed and implemented in Alabama, and will enable farmers to directly sell vegetables to consumers, tuktuk drivers to deliver products to consumers, and consumers to pay by credit card. The App automatically credits farmers' bank accounts for payment of vegetables purchased, tuktuk drivers for delivery payments, and payment as percentages of sale on management for the App management in Battambang (University of Battambang, UBB), and in the USA.
 - v. The study on 'Time-motion Study and Task Analysis of Conservation Agriculture Vegetable Production in Northwest Cambodia', was presented by Sothea Rien at the 11th International Conference on Environmental and Rural Development, in Siem Reap, Cambodia on 29th February – 1st March, 2020.
 - vi. The study 'Status and trends in agricultural mechanization in Cambodia', by Pao Srean, Lytour Lor, and Saruth Chan was presented in the 6th ASMIH Advisory Meeting at Royal University of Agriculture on 21st February, 2020.
- d. Appropriate Scale Mechanization Innovation Hub – Ethiopia (ASMIH-Ethiopia)
 - i. Construction and procurement of solar dryers and storage structures: twelve metal siloes with 200kg capacity were designed and manufactured for experiments; a collapsible dryer with a capacity of 1000 kg was procured from HiTech Trading.; a traditional storage structure such as "Gota" was manufactured locally with the help of farmers; and hermetic bags such as the Purdue Improved Crop Storage (PICS) and polypropylene bags were procured from local market.
 - ii. Experimental activities including drying, threshing and storage: two varieties of freshly harvested maize grain samples were collected from farmers for drying and storage experiments; drying experiments of maize cob and maize grain using a solar bubble dryer, a solar collapsible dryer and an open sun drying method were conducted; maize cob at different moisture levels were threshed both mechanically and by hand to see the effects on the insect infestation during storage; drying data (moisture and temperature profile) were collected and partially analyzed.
 - iii. A focus group was held on "rent to own" principles for technology transfer and five farmers were selected for a based on four criteria: 1) willingness to participate in the experiment; 2) availability of plots for irrigated forage production; 3) availability of shallow groundwater wells (less than 10 m); and 4) willingness to pay for the technology based on 'rent to own' principles. The experimental setup was completed for the five farmers and once production started, data were collected based protocol developed for irrigated forage production.

4. Center for Excellence on Sustainable Agricultural Intensification and Nutrition (CE SAIN)

- a. CE SAIN hired five staff members (three women) for Finance/Business Manager, two Project Coordinators (CAST and F2F projects) and two Aquaculture Technicians. Additionally, two female staff members were promoted to Program Manager and Program Officer. Ten interns (six women) were recruited to join Internship Program at various Technology Parks to learn and do hands-on practices and receive mentoring support from Farm Managers and the CE SAIN team on both technical and soft skills.

- b. Two new projects were developed with the USAID Farmer-to-Farmer Program. These projects provide technical assistance from U.S. volunteers to support several host organizations in implementing their activities.
- c. To strengthen private sector engagement activities, CE SAIN has collaborated with the Borlaug Higher Education for Agricultural Research and Development (BHEARD) program at Michigan State University, which awarded four projects to researchers and professors so that they can implement activities and identify the possibility to commercialize their research findings or innovations.
- d. The five Agriculture Technology Parks (ATPs) had a total of 1,236 individuals (569 women, 46%) who visited CE SAIN's Technology Parks. The group members represented farmers, academia, NGOs, youth groups, USG partners, Innovation Lab teams, business owners, researchers, and high-ranking government officials (Secretary of State of Ministry of Education Youth and Sport and the U.S. Ambassador).
- e. CE SAIN continued the lecture series and short-term training programs to build local capacity.
- f. CE SAIN was awarded additional funds by the American Soybean Association (ASA) to conduct swine and chicken feeding trials.
- g. Discussions are underway to establish more gardens and technology parks at three additional high schools (integrated farming systems concept) to increase youth engagement in the agriculture sector.
- h. CE SAIN signed an agreement with Swisscontact to collaborate on conservation agriculture services, curriculum development (with the Royal Agriculture University of Cambodia), and the creation of additional ATPs in different agroecological regions.

5. Associate Award - Policy Research Consortium (PRC)

- a. The consortium organized a workshop and listening session on October 28-29, 2019, at the National Press Club in Washington in partnership with USAID. Participants examined the role of policy change in contemporary agricultural transformation and the use of evidence in understanding and influencing policy change. They also explored programmatic and policy needs, especially with respect to the four new USAID Centers (agriculturally led growth, nutrition, water, and resilience) under the new Bureau for Resilience and Food Security (BRFS). The discussion with USAID allowed consortium members to identify: (1) policy changes that were influenced by USAID activities and had important impacts on food and agriculture in Feed the Future countries; (2) policies that block the impact of USAID programs; (3) methods that have been used to generate the political will to change policies; and (4) ways in which the final year of the Consortium's work can be made most useful to USAID.
- b. Dr. Will Masters of Tufts University, and colleagues, will continue their work on developing an indicator to measure the market cost of nutritious diets, as a nutrient-adequate diet is out of reach for many people and targeted action is needed to lower and stabilize prices of nutrient-rich foods and diets.
- c. A special issue of the Journal of Food and Industrial Organization (JAFIO) featured research from different PRC consortium members and is in the process of being edited by Dr. Andrew Schmitz of the University of Florida.
- d. Dr. Lori Post of Northwestern University continues to work on gender issues and their relationship to food security. In her research, she found that although women are key to food production and food security, policy solutions are often not sensitive to this reality. Her review of laws and constitutional provisions for women has found that number of protections to be low and not robust. She will focus on how conflict disproportionately affects women, the under-representation of women in government and in decision-making processes, and the token involvement of women in policy without addressing things like gender-based violence or lack of power.

6. Research Prioritization and Subawards

- a. Unlocking the production potential of “polder communities” in coastal Bangladesh
 - i. Local capacity building: The SIIL-Polder team organized trainings for five Learning Hubs in Polder 30 on fertilizer and pest management, with a focus on rodent management in rice. A total of 55 men and women farmers participated in the training program.
 - ii. The team identified four polders adjacent to Polder 30, where the findings of the SIIL-Polder Project has the potential to be scaled-up for improving food security and income of the climate-vulnerable rural community.
 - iii. The project provided training to 91 women farmers and women leaders in the southwest region on fertilizer and pest management in HYV rice, rabi crops cultivation on moist soil and management practices for higher yield and income, and importance of zinc-enriched rice, maize, mungbean and sunflower on household nutrition, especially on children and lactating women.
 - iv. Empowerment of 17 male youth on cost-effective fertilizer and weed management in dry season cropping by using mini-tillers and encouraged them to develop as agri-entrepreneurs.
- b. SI integration of crop and livestock production systems in the Sahelian zone of Burkina Faso
 - i. This project has been completed and is in the process of being closed out. Therefore, there are no activities to report during this period. Full results from the project will be highlighted in the SIIL Five-Year Report available in June 2020.
- c. Women in Agriculture Network (WAgN) Cambodia
 - i. Submitted three manuscripts to peer-reviewed journals.
 - ii. Ms. Sovanneary Huot completed her M.S. program which focused on gender roles within Cambodian agricultural cooperatives.
 - iii. Awarded \$175k grant to develop UBB capacity through the World Bank Higher Education Improvement Project as a direct result of the WAgN project.
 - iv. Developed a nursery network focused on wild food plant propagation and distribution. One Battambang nursery is producing over 500 *Acacia pennate*, which will become a key component of wild gardens in the S3 Green Labs.
 - v. The WAgN team developed a successful proposal for the second phase of SIIL titled *S3-Cambodia: Scaling Suitable Sustainable Technologies*. This proposed project features a prominent youth engagement component, focused on CE SAIN-partner high schools and vocational agriculture high schools across Cambodia.
- d. Sustainably Intensified Production Systems Impact on Nutrition (SIPSIN) in Ethiopia
 - i. This project is complete and has been closed out. Therefore, there are no activities to report during this period. Full results from the project will be highlighted in the SIIL Five-Year Report available in June 2020.
- e. Adoption of SI in dual-purpose millet – leguminous crops – livestock systems in Senegal
 - i. Field days in Bambey and Passy were organized by Agence National de Conseil Agricole et Rural (ANCAR) and a workshop to share the dual-purpose millet trials was organized by farmer organization RESOPP (Reseau des Organisations Paysannes et Pastorales du Senegal) in Thies for local and lead farmers, co-PIs, RESOPP technicians (farmers' Co-Op), researchers, extension agents, and processors to provide capacity-building opportunities in the region.
 - ii. As part of the development of millet for the manufacture of poultry feed, six (6) chicken coops were installed in the community of Malicounda. By using pearl millet seed by-products (hulls), women in the community were able to grow chickens, enabling them to generate extra income and provide animal-based protein to their families.
 - iii. The biochemical analysis of the five varieties of millet carried out shows first that the introduced varieties (SL423 and SL169 particularly) are generally richer in carbohydrates, proteins and minerals than the references (Souna3 and Tchalack). It was noted that among the varieties introduced, SL423 and SL169 would be more suitable for making infant flours because their

micronutrients, proteins and carbohydrate contents. Thus, SL423 would be more suitable against micronutrient (ferrous and zinc particularly) malnutrition, while SL169 would be more able to fight against protein-energy malnutrition.

- f. Raising crop response: bidirectional learning to catalyze SI at multiple scales in Tanzania
 - i. A new policy on maize price regulation was developed and disseminated to over 150 policy makers, donors, advocacy groups and farmers unions.
 - ii. Innovations in client-oriented extension include utilization of the LandPKS smartphone application to reach farmers with extension recommendations in the Southern Highlands, documented in a Land Development and Degradation published journal article.
 - iii. A paper was submitted that documented current status and how to improve child feeding practices, based on a household survey and sampled food portions analyzed for aflatoxin: 'Monotonous Cereal Based Complementary Feeding Contributes to Aflatoxin Exposure in Children'.

Additional initiatives:

- g. Precision Agriculture for Smallholder Systems in Africa
 - i. This project is complete and has been closed out. Therefore, there are no activities to report during this period. Full results from the project will be highlighted in the SILL Five-Year Report available in June 2020.
- h. Research Output Dissemination Study (RODS)
 - i. The RODS project focused on evaluating the path from development to end-user for selected innovations produced by the Feed the Future Innovation Labs. The RODS team has completed their report and the results will be highlighted in the SILL Five-Year Report available in June 2020, as well as the USAID's Development Experience Clearinghouse (DEC) repository.

7. Crosscutting Impacts on Gender and Nutrition

- a. The SILL subaward in Bangladesh provided training to 91 women farmers and women leaders in the southwest region on fertilizer and pest management in high yielding variety (HYV) rice, rabi crops cultivation on moist soil and management practices for higher yield and income. They were trained on the importance and role of zinc-enriched rice, maize, mungbean and sunflower on household nutrition, especially on children and lactating women.
- b. The WAgN project in Cambodia supported Sovanneary Huot in her MS thesis on women's leadership in farm cooperatives. Outcomes included identifying barriers to leadership and suggestions on how to address them through qualitative studies of two women's cooperatives.
- c. Female graduate student, Awa Faye, defended her Ph.D. in December 2019. This is a great example of SILL sponsored projects in Senegal, which helped build future female scientists capacity in Senegal. The title of her dissertation was "Development of a model estimating the root length density of pearl millet in field conditions to evaluate the response of the root system to drought, fertilization and planting density under real conditions".
- d. As a part of the Dual-purpose millet project in Senegal, six women's processing organizations (l'Union Communale des Acteurs de l'Agro-Alimentaire de Ndongol, de Malicoundakeur maissa, Boolo Diokhoul Diawrine, GIE Kane Kane, and GPF Fass Diom Koussanar) generated extra income of \$1,058 by selling millet-based products. There was a total of 175 women involved in the six organizations.
- e. The ASMIH-Bangladesh project held a training on "Gender and Women Entrepreneurship: from Farmers to Entrepreneurs" Boratia village, with 30 women participants who are currently involved in seedling raising activities using ASMIH introduced technology. The training focused on different aspect of Small and Medium Entrepreneur (SME) development.
- f. The ASMIH-Ethiopia conducted a basic training on nutrition for extension workers and farmers on January 25-26, 2020 in Bahir Dar. A total of 18 extension workers and 53 farmers were trained and the objectives were to introduce about basics of nutrition concepts, the effects of malnutrition on social and

economic development, help them recognize the relationship between Water, Sanitation and Hygiene (WASH) practices and nutrition, illustrate social and behavior change communications (SBCC), and enable them apply SBCC models in promoting technologies and healthy behaviors among farmer households.

- g. The ASMIH-Burkina Faso project supported graduate student Sadiou Dianda in conducting a gender study on labor divisions among smallholder farmers. This study included 345 farmers and it found that 65-70% of manual farming work is done by women and children. The thesis was successfully defended on December 20, 2019, and the project hopes to use the data collected to design technologies to help decrease the burden placed on women and children on smallholder farms.

B. Issues or concerns encountered during the reporting period

- a. The majority of the reporting period (October – March), SILL had not encountered any serious issues. However, as the COVID-19 pandemic issues emerged, projects have slowed or postponed research activities, fieldwork, training and other capacity-building activities in most of our focus countries, as all travel has been limited to essential travel only. Several of our subawards had prior no-cost extensions, but some may need extra time in the coming months, depending on the duration of the crisis. Some projects are reporting a loss of the growing season as a result of the pandemic. It remains to be seen how the subawards will be impacted in the future, given the current disruptions and conditions.

Human and Institutional Capacity Development

A. Short-term training

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained		
			M	F	Total
Bangladesh	Training on Mechanical Harvesting of Rice in Aman Season 2019	Producers	36	42	78
Bangladesh	Refresher Advanced Training on Harvesting Technologies, Subarnchar, Noakhali	Producers, Private Sector	10	0	10
Bangladesh	Refresher Advanced Training on Harvesting Technologies - Kolapara, Patuakhali	Producers, Private Sector	10	0	10
Bangladesh	Field Day on Rice Transplanters - Boratia, Dumuria, Khulna	Producers	7	17	24
Bangladesh	Field Day on Rice Transplanters – Kulbaria, Dumuria, Khulna	Producers	21	1	22
Bangladesh	Refresher advanced training on harvesting technologies - Dumuria, Khulna	Producers , Private Sector	10	1	11
Bangladesh	Field Day on Rice Transplanters – Wazirpur, Barishal	Producers, Civil Society	18	1	19
Bangladesh	Refresher Advanced Training on Harvesting Technologies - Wazirpur, Barishal	Producers , Private Sector	9	1	10
Bangladesh	Training on Rice Transplanters and Seedling Raising – Boratia, Khulna	Producers	10	4	14
Bangladesh	Hands-On Training for Soybean Planting Using CA machinery - Noakhali	Producers , Private Sector	8	2	10
Bangladesh	Women's Entrepreneurship and Gender Development Training	Producers	0	30	30
Bangladesh	Hands-On Training for Mungbean Planting Using CA machinery – Patuakhali	Producers, Government, Private Sector	8	2	10
Bangladesh	Hands-On Training for Mungbean Planting Using CA machinery – Barishal	Producers , Private Sector	8	2	10
Burkina Faso	Annual Animal Nutrition Training	Producers	370	58	428
Cambodia	Focus Group: Farmer Perceptions on Cover Crops, Soil Fertility and CA Practices	Producers, Government	10	3	13

Country of Training	Brief Purpose of Training	Who was Trained	Number Trained		
			M	F	Total
Cambodia	Focus Group: Farmer Perceptions on Cover Crops, Soil Fertility and CA Practices	Producers	16	2	18
Cambodia	Field Day – Banan District, Battambang	Producers, Government, Private Sector, Civil Society	65	9	74
Cambodia	Field Day – Sansam Mlub Prey Farmers' Group	Producers, Government, Civil Society	9	4	13
Cambodia	6 th Hub Advisory Committee Meeting	Government, Private Sector, Civil Society	30	6	36
Cambodia	Field Trip – 2 nd year RUA Students to Tech Park	Producers, Government, Private Sector, Civil Society	20	5	25
Cambodia	Field Trip – 3 rd year RUA Students to Tech Park	Producers, Government, Private Sector, Civil Society	21	10	31
Cambodia	Tomato Grafting for Rainy Season Production	Producers, Government, Private Sector	13	11	24
Cambodia	Conservation Agriculture Principles	Producers	10	8	18
Cambodia	Seed System Management	Civil Society	18	4	22
Ethiopia	Nutrition and Food Safety	Government	12	8	20
Ethiopia	Nutrition Training for Farmers	Producers, Government	28	27	55
Ethiopia	Manufacturing of Animal Feed with Chopper and Grinder	Producers, Government, Private Sector	9	4	13
Ethiopia	Training on start-up foundation	Government, Private Sector	18	7	25
Ethiopia	Book-Keeping and Savings for Farmers	Producers, Government	20	15	35
Ethiopia	Maji Pump Preventative Maintenance and Service	Producers, Government	19	14	33
Ethiopia	Conservation Agriculture Practices: Benefits and Constraints	Government	21	15	36
Ethiopia	Water-Lifting Technologies and Agricultural Water Management Tools	Government, Producers	21	15	36
Ethiopia	Fabrication of Motorized Maize Sheller	Government, Private Sector	10	4	14
Ethiopia	Motorized Maize Sheller Operation and Preventative Maintenance	Private Sector	7	3	10
Senegal	Sharing Results Workshop	Producers, Government, Private Sector	27	11	38
Total	Thirty-five total trainings were held during reporting period		929 (73%)	346 (27%)	1275

B. Long-term training*

Name	Sex	University	Degree	Major	Program End Date (month/year)	Degree Granted (Y/N)	Home Country
Md. Meshkat Ali	M	Bangladesh Agricultural University	M.S.	Agricultural Engineering	November 2020	N	Bangladesh
Md. Kamrul Hasan	M	Sylhet Agricultural University	Ph.D.	Agricultural Engineering	June 2020	N	Bangladesh
Md. Faruqul Islam	M	Bangladesh Agricultural University	M.S.	Agricultural Engineering	November 2020	N	Bangladesh
Md. Abdul Motalib	M	Bangladesh Agricultural University	Ph.D.	Agricultural Engineering	June 2020	N	Bangladesh
Surajit Sarkar	M	Bangladesh Agricultural University	Ph.D.	Agricultural Engineering	June 2020	N	Bangladesh
Md. Imran Siddiquee	M	Bangladesh Agricultural University	M.S.	Agricultural Engineering	November 2020	N	Bangladesh
Deb Nath	M	Bangladesh Agricultural University	Ph.D.	Water Governance and Management	June 2020	N	Bangladesh
Awa Barro	F	Institute of Rural Development/Nazi Boni University	M.S.	Agricultural Engineering	December 2019	Y	Burkina Faso
Saidou Dianda	M	Institute of Rural Development/Nazi Boni University	M.S.	Agricultural Engineering	December 2019	Y	Burkina Faso
Hafsatou Koudougou	F	Institute of Rural Development/Nazi Boni University	M.S.	Agricultural Engineering	December 2019	Y	Burkina Faso
Ouda Sanfo	M	Institute of Rural Development/Nazi Boni University	M.S.	Agricultural Engineering	December 2019	Y	Burkina Faso
Linda Zugmore	F	Institute of Rural Development/Nazi Boni University	M.S.	Agricultural Engineering	March 2020	Y	Burkina Faso
Rotha Chork	M	Royal University of Agriculture**	M.S.	Agronomy	July 2020	N	Cambodia
Sreychou Heng	F	Royal University of Agriculture**	M.S.	Animal Science	July 2020	N	Cambodia
Bunseng Lam	M	Royal University of Agriculture**	M.S.	Agronomy	July 2020	N	Cambodia
E-Nieng Muth	F	Royal University of Agriculture**	M.S.	Agronomy	July 2020	N	Cambodia
Rathana Nai	F	Royal University of Agriculture**	M.S.	Food Science/Post-Harvest Technology	July 2020	N	Cambodia
Sreymey Ngoun	F	Royal University of Agriculture**	M.S.	Crop Science	July 2020	N	Cambodia
Channy Sambo	F	Royal University of Agriculture**	M.S.	Veterinary Science	July 2020	N	Cambodia

Name	Sex	University	Degree	Major	Program End Date (month/year)	Degree Granted (Y/N)	Home Country
Sokol Yem	F	Royal University of Agriculture**	M.S.	Agronomy	July 2020	N	Cambodia
Mov Sok	M	Royal University of Agriculture**	B.S.	Agro-Industry	August 2020	N	Cambodia
Puthearith Thorng	F	Royal University of Agriculture**	B.S.	Agro-Industry	August 2020	N	Cambodia
Sengthai Ry	M	Royal University of Agriculture**	B.S.	Agro-Industry	August 2020	N	Cambodia
Sopheha Yim	M	Royal University of Agriculture**	B.S.	Agro-Industry	August 2020	N	Cambodia
Kimvai Hong	M	Royal University of Agriculture**	B.S.	Agronomy	August 2020	N	Cambodia
Rachany Kry	F	Royal University of Agriculture**	B.S.	Agronomy	August 2020	N	Cambodia
Pheakdey Chan	M	Royal University of Agriculture**	B.S.	Agronomy	August 2020	N	Cambodia
Ratha Mang	M	Royal University of Agriculture**	B.S.	Agricultural Engineering	August 2020	N	Cambodia
Sunnicole Ka	F	Royal University of Agriculture**	B.S.	Agricultural Engineering	August 2020	N	Cambodia
Nary Suy	F	Royal University of Agriculture**	B.S.	Agricultural Engineering	August 2020	N	Cambodia
Phuchongdarasamng Ban	M	Royal University of Agriculture**	B.S.	Animal Science	August 2020	N	Cambodia
Chruk Sang	M	Royal University of Agriculture**	B.S.	Animal Science	August 2020	N	Cambodia
Srey Chomkat Roeurn	F	Royal University of Agriculture**	B.S.	Veterinary Medicine	August 2020	N	Cambodia
Kimheang Soeur	M	Royal University of Agriculture**	B.S.	Veterinary Medicine	August 2020	N	Cambodia
Pheaktra Sim	M	Royal University of Agriculture**	B.S.	Fisheries Science	August 2020	N	Cambodia
Buntha Sem	M	Royal University of Agriculture**	B.S.	Fisheries Science	August 2020	N	Cambodia
Chanthin Ouk	F	Royal University of Agriculture**	M.S.	Agronomy	December 2021	N	Cambodia
Biya Chhorn	F	University of Battambang	M.S.	Sustainable Agriculture	February 2020	Y	Cambodia
Sovaneary Huot	F	Penn State University	M.S.	Rural Sociology	March 2020	Y	Cambodia
Ry Saren	M	University of Battambang	B.S.	Agriculture	May 2021	N	Cambodia
Chana Thay	M	University of Battambang	M.S.	Horticulture	May 2020	N	Cambodia
Ayinadis Molla Asemu	F	Bahir Dar University	Ph.D.	Post-Harvest Technology	June 2020	N	Ethiopia
Bekelech Getachew	F	Bahir Dar University	M.S.	Food Engineering	June 2020	N	Ethiopia
Mihret Negera	F	Bahir Dar University	M.S.	Gender and Development	September 2020	N	Ethiopia
Askalemariam Sahilu	F	Bahir Dar University	M.S.	Post-Harvest Technology	October 2020	N	Ethiopia

Name	Sex	University	Degree	Major	Program End Date (month/year)	Degree Granted (Y/N)	Home Country
Solomon Teskeste	M	Bahir Dar University	Ph.D.	Agricultural Mechanization Engineering	June 2022	N	Ethiopia
Tamirat Yifter	M	Bahir Dar University	M.S.	Industrial Engineering	September 2020	N	Ethiopia
Thierno Ba	M	University of Thies (ENSA)	Ph.D.	Animal Science	June 2020	N	Senegal
Aida Mangawa	F	Chiekh Anta Diop University	Ph.D.	Food Processing and Nutrition	June 2020	N	Senegal
Marie-Thérèse Mofini	F	Chiekh Anta Diop University	Ph.D.	Agronomy	June 2020	N	Senegal
Ablaye Ndour	M	University of Thies	Ph.D.	Agricultural Economics	March 2023	N	Senegal
Fatou Tine	F	University of Thies	Ph.D.	Agronomy	June 2020	N	Senegal
Coly Wade	M	University of Thies (ENSA)	Ph.D.	Soil Fertility	June 2020	N	Senegal
Rufina Fredrick	F	Nelson Mandela African Institute of Science and Technology, Tanzania	M.S.	Nutrition	December 2020	N	Tanzania
Esther Mugi	F	University of Wageningen	Ph.D.	Agricultural Systems	December 2020	N	Tanzania
Alison Nord	F	Michigan State University	Ph.D.	Agro-Ecology	December 2019	Y	United States

* Table includes new or revised long-term training since the FY 2019 Annual Report

** Royal University of Agriculture are all part of the Center of Excellence on Sustainable Agricultural Intensification and Nutrition (CE SAIN)

Innovation Transfer and Scaling Partnerships

A. Appropriate Scale Mechanization Consortium

- a. Animal-Drawn Row Crop Cultivators – Phase 2 (under field testing)**
 - i. Partnerships: Nazi Boni University – Bobo Dioulasso, Tillers International, local blacksmith organizations, national Fund for Research and Innovation for Development (FONRID), Michigan State University
- b. Animal-Drawn Single Row Planter – Phase 2 (under field testing)
 - i. Partnerships: Nazi Boni University – Bobo Dioulasso, Tillers International, local blacksmith organizations, national Fund for Research and Innovation for Development (FONRID), Michigan State University
- c. Conservation Ripper – Phase 2 (under field testing)
 - i. Partnerships: Nazi Boni University – Bobo Dioulasso, Tillers International, local blacksmith organizations, national Fund for Research and Innovation for Development (FONRID), Michigan State University
- d. Drip Irrigation Using Solar-Powered Pumps – Phase 2 (under field testing)
 - i. Partnerships: Majipump, Bahir Dar University, local farmer associations, Feed the Future Innovation Lab for Small-Scale Irrigation (ILSSI)
- e. Engine-Driven Maize Sheller – Phase 2 (under field testing)
 - i. Partnerships: Tillers International, Bahir Dar Institute of Technology
- f. Mini-Combine Rice Harvester – Phase 2 (under field testing)

- i. Partnerships: ACI Motors Ltd., Metal Pvt. Ltd., Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI)
- g. Multi-Crop Versatile Seed Broadcaster – Phase 2 (under field testing)
 - i. Partnerships: Department of Agricultural Engineering (DAEng) within the Ministry of Agriculture in Cambodia; Department of Agricultural Land Resources Management (DALRM) and Conservation Agriculture Service Center (CASC) under supervision of the General Directorate of Agriculture (GDA) in Cambodia; Centre de Coopération en Recherche Agronomique pour le Développement (CIRAD); Swisscontact
- h. Power-Tiller Seeder – Phase 1 (under research)
 - i. Partnerships: Department of Agriculture Engineering (DAEng) within the Ministry of Agriculture in Cambodia; Conservation Agriculture Service Center (CASC) in Cambodia
- i. Refined Yoke – Phase 2 (under field testing)
 - i. Partnerships: Nazi Boni University - Bobo Dioulasso; Tillers International, Michigan State University
- j. Rice Reaper – VR-120 – Phase 2 (under field testing)
 - i. Partnerships: Bangladesh Agricultural University (BAU), ACI Motors Ltd., Metal Pvt Ltd., Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI)
- k. Rice Transplanter – Phase 3 (made available for uptake)
 - i. Partnerships: Bangladesh Agricultural University (BAU), ACI Motors Ltd., Metal Pvt Ltd., Department of Agriculture Extension (DAE) subsidy program
- l. Tractor-Pulled Direct Seeder – Phase 2 (under field testing)
 - i. Department of Agricultural Engineering (DAEng) within the Ministry of Agriculture in Cambodia; Department of Agricultural Land Resources Management (DALRM) and Conservation Agriculture Service Center (CASC) under supervision of the General Directorate of Agriculture (GDA) in Cambodia; Centre de Coopération en Recherche Agronomique pour le Développement (CIRAD); Swisscontact

B. Dual-Purpose Millet - Leguminous Crops - Livestock Systems

- a. Nitrogen sources for dual-purpose millet – Phase 2 (under field testing)
 - i. Partnerships: ISRA, University of Dakar
- b. Dual-purpose millet variety SL28 – Phase 2 (under field testing)
 - i. Partnerships: ISRA, SMIL
- c. Dual-purpose millet variety SL423 – Phase 2 (under field testing)
 - i. Partnerships: ISRA, SMIL
- d. Dual-purpose millet variety SL169 – Phase 2 (under field testing)
 - i. Partnerships: ISRA, SMIL

C. Unlocking the production potential of polder communities in Bangladesh

- a. Resilient cropping patterns for the polder ecosystem – Phase 3 (made available for uptake)
 - i. Partnerships: IRRI, BRAC, local public universities

D. Women in Agriculture Network (WAgN) Cambodia

- a. Green manure cover and relay cropping after rice - Moved from Phase 3 (made available for uptake) to Phase 4 (demonstrated uptake by public/private sector)
 - i. Partnerships: ECHO Asia, CIRAD, CE SAIN
- b. Tomatoes grafted onto eggplant rootstock - Phase 4 (demonstrated uptake by public/private sector)
 - i. Partnerships: University of Battambang, World Vegetable Center, Agriculture Development Denmark Asia (ADDA), CE SAIN
- c. Wild Gardens - Moved from Phase 3 to Phase 4
 - i. Partnerships: University of Battambang, ECHO Asia, World Vegetable Center, Kasetsart University, CE SAIN, CIRAD/Conservation Agriculture Service Center (CASC)

*** Note: The innovations described above reflect the technology development phases for each innovation from October 1, 2019 – March 31, 2020. All innovations will be reported in the FY 2020 Annual Report.

Future Work

- A.** SIIL will continue to support their consortia and subawards as they gear-up for the next phase of the Lab's work around the world.
- B.** SIIL will focus on the successful implementation of iREACH in West Africa.
- C.** SIIL will continue to support the capacity-building efforts in focus countries and regions, especially with CE SAIN, as they work with the RUA to become administratively autonomous.
- D.** SIIL will continue to monitor, address, and provide support with regards to any implementation issues across their research portfolio as related to the global COVID-19 crisis.