Feed the Future Innovation Lab for Fish

Annual Report October 2018 - September 2019

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Cooperative Agreement 7200AA18CA0030

November 26, 2019

Management Entity Information

The Feed the Future Innovation Lab for Fish (Fish Innovation Lab) is managed by Mississippi State University (MSU) and is housed in the MSU Global Center for Aquatic Food Security, which is affiliated with the College of Veterinary Medicine.

Members of the Management Entity

- Mark L. Lawrence, Director (88%)

- Peter Allen, Aquaculture Specialist (8%)

- Kathleen Ragsdale, Gender/Youth Specialist (17%)

- Shauncey Hill, Program/Finance Manager (77%)

- Kristen Dechert, Communications Manager (100%)

Advisory Committee

The Fish Innovation Lab Management Entity (ME) is advised by the Fish Innovation Lab External Advisory Board (EAB), who provides strategic direction for Fish Innovation Lab goals and objectives, gives scientific oversight for Fish Innovation Lab activities, and monitors progress toward Fish Innovation Lab objectives.

Members of the Fish Innovation Lab External Advisory Board

- Rohana Subasinghe, FutureFish Managing Director

- Michael Phillips, Director of the Consultative Group on International Agricultural Research (CGIAR) Research Program on Fish Agri-Food Systems and WorldFish Director of Aquaculture and Fisheries

- Melba B. Reantaso, Aquaculture Officer at the Food & Agriculture Organization

- Bryan McCoy, Chief Executive Officer, Yalelo, and Director of FirstWave Group

- Karen Veverica, Former Director, Auburn University E.W. Shell Fisheries Research Center

Countries Where the Fish Innovation Lab Works[1]

In Federal Year (FY) 2019, the Fish Innovation Lab implemented Quick Start projects in Bangladesh, Kenya, Nigeria, and Zambia (Figure 1).
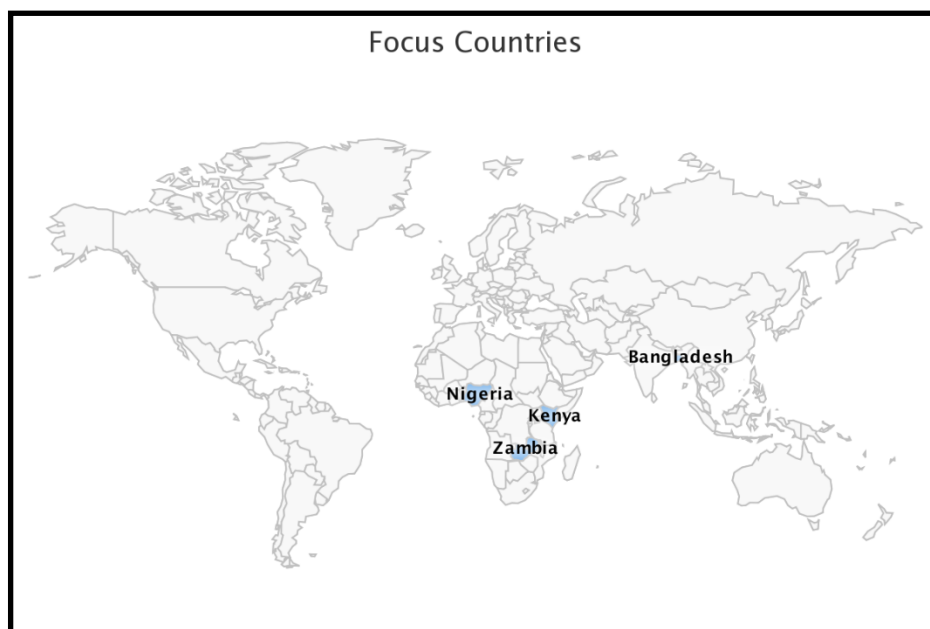

Figure 1: Location of Fish Innovation Lab Quick Start Projects

Fish Innovation Lab Management Entity Program Partners

University of Rhode Island

- Elin Torell, Deputy Director (50%)
- Catherine McNally, Capacity Development Specialist (50%)
- Brian Crawford, West Africa Specialist (17%)
- Austin Humphries, East Africa Specialist (25%)

Research Triangle Institute International

- Joanna Springer, Monitoring, Evaluation, and Learning Advisor (100%)

Washington University in St. Louis

- Lora Iannotti, Nutrition Specialist (8%)

Texas State University

- Madan Dey, Asia Specialist (25%)

The Fish Innovation Lab has in-country coordinators in our priority regions to facilitate and coordinate Fish Innovation Lab activities in the region.

- Andrew Wamukota, Kenya Coordinator contracted for six months (50%)
- Md. Gulam Hussain, Bangladesh Coordinator contracted for six months (50%)

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[1] This includes the countries where Fish Innovation Lab supported the implementation of Year 1 Quick Start projects.

Abbreviations and Acronyms

AO	Agreement Officer
AOR	Agreement Officer's Representative
BMGF	Bill and Melinda Gates Foundation
BMU	Beach Management Unit
CDAIS	Capacity Development for Agricultural Innovation Systems
CGIAR	Consultative Group on International Agricultural Research
CLA	Collaborating, Learning, and Adapting
EAB	External Advisory Board
EMMP	Environmental Management and Mitigation Plan
FGD	Focus Group Discussion
FTFMS	Feed the Future Monitoring System
FY	Federal Year
GBS	Genotyping by Sequencing
HICD	Human and Institutional Capacity Development
IACUC	Institutional Animal Care and Use Committee
IFPRI	International Food Policy Research Institute
IGBB	Institute for Genomics, Biocomputing, and Biotechnology
IITA	International Institute of Tropical Agriculture
IRB	Institutional Review Board
KII	Key Informant Interview
ME	Management Entity
M&E	Monitoring and Evaluation
MEL	Monitoring, Evaluation, and Learning
MoFL	Ministry of Fisheries and Livestock
MoH	Ministry of Health
MSU	Mississippi State University
NGO	Non-Governmental Organization
NRDC	Natural Resources Development College
PI	Principal Investigator
PIRS	Performance Indicator Reference Sheet
RFA	Request for Applications
RTI	Research Triangle Institute International
SCP	Single-Cell Protein
SNP	Single Nucleotide Polymorphisms
TSU	Texas State University
UNZA	University of Zambia

URI	University of Rhode Island
USAID	United States Agency for International Development
USG	United States Government
WEFI	Women's Empowerment in Fisheries Index
WUSTL	Washington University in St. Louis

Glossary

Aquaculture: "The farming of aquatic organisms, including fish, mollusks, crustaceans, and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated" (FAO, 1988).

Gender Integration: Strategies employed to ensure women's and men's attitudes, roles, responsibilities, concerns, and experiences are an integral dimension of the design, implementation, monitoring, and evaluation of research and extension. Differences are recognized and routinely addressed for all activities.

Gender Equality: Norms, values, attitudes, and perceptions required to attain equal status between women and men without neutralizing the biological differences between women and men.

Small-Scale fisheries: Also referred to as artisanal fisheries. Characteristics differ among countries, but the term generally means "traditional fisheries involving fishing households (as opposed to commercial companies), using a relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption" (FAO, 2014). "Women are significant participants in the sector, particularly in post-harvest and processing activities. It is estimated that about 90% of all people directly dependent on capture fisheries work in the small-scale fisheries sector. As such, small-scale fisheries serve as an economic and social engine, providing food and nutrition security, employment and other multiplier effects to local economies while underpinning the livelihoods of riparian communities" (FAO, SSF Guidelines, 2015).

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I. Executive Summary

The Feed the Future Innovation Lab for Fish (Fish Innovation Lab) began in September 2018 and has completed its first twelve months. The Fish Innovation Lab's first major undertaking was establishing the Management Entity (ME) at Mississippi State University (MSU) and the ME Partners at the University of Rhode Island (URI), Research Triangle Institute International (RTI), Washington University in St. Louis (WUSTL), and Texas State University (TSU). Five one-year research and capacity-building activities (Quick Start projects) were established in the first year. These five projects are being implemented in Nigeria, Kenya, Bangladesh, and Zambia, and they were responsible for all the research and capacity-building activities implemented under the Fish Innovation Lab in Year 1. Their activities range from experiments to replace fish meal with single-cell proteins (SCPs), analysis of the post-harvest chain for fish, analysis of indigenous species for nutrition in vulnerable populations, and genome analysis of rohu carp. Year 1 of the Fish Innovation Lab was also important for establishing and building collaborative relationships. For example, one of the Quick Start projects works collaboratively with a WorldFish project in Nigeria funded by the Bill and Melinda Gates Foundation (BMGF). Another Quick Start project features collaboration with a U.S. company (Meridian Biotech, which is providing the SCP ingredient), and two companies in Zambia (Aller Aqua Zambia, which is providing the fish feed base mash, and Yalelo, which is providing tilapia). Each company is contributing to the project and is interested in the results for potential adoption of findings. A major undertaking during the second half of Federal Year (FY) 19 was implementing the first request for applications (RFA) process, which will be the main vehicle for funding and implementing research-for-development projects in Feed the Future priority countries. The Fish Innovation Lab received over 240 concept notes and 39 full proposals by the established deadlines. After a rigorous, multi-step review process, the final awards will be completed in the first quarter of FY20. Other important accomplishments for the Fish Innovation Lab include development of its website and building networks for disseminating knowledge and information.

II. Program Activities and Highlights

FY19 was the Fish Innovation Lab's first year of operation. Following its theory of change and results framework, it implemented several research and program management-related activities:

- Launched five Quick Start projects, which are implemented in Nigeria, Zambia, Bangladesh, and Kenya:
    - Analysis of the Aquaculture Post-harvest Chain in Nigeria
    - Assessing Facilitators and Barriers to Aquaculture and Fish Consumption in Zambia (Fish4Zambia)
    - Genome Sequencing and Development of Single Nucleotide Polymorphisms (SNP) markers from Rohu in Bangladesh
    - Improved Nutrition Among Vulnerable Populations in Kenya Through Increased Access to and Consumption of Sustainable Fish Foods (SecureFish)
    - Replacing Fishmeal with Single Cell Proteins in Tilapia *Oreochromis niloticus* Diets in Zambia

- Highlighted Quick Start progress and lessons learned during international meetings and seminars. Videos were developed to showcase the Quick Start projects in Nigeria and Zambia, and the Zambia video was premiered during the Annual Meeting of the Feed the Future Innovation Labs in September 2019. The Quick Start teams prepared abstracts and presentations to showcase results.

- Involved undergraduate students in Quick Start implementation, which provided invaluable field experience. Robert Sakapaji and Mwatikosela Tembo from the University of Zambia (UNZA) and Laura Ingouf from MSU helped with collecting data in the Lake Bangweulu region of Samfya District, Luapula Province, Zambia. During this time, the Fish4Zambia team administered 397 Women's Empowerment in Fisheries Index (WEFI) surveys to men, women, and youth across the fish value chain and conducted 21 focus group discussions among men, women, and youth across the fish value chain.

- Established its management structure. The Fish Innovation Lab defined roles of its ME and ME Partners. It established an External Advisory Board (EAB) consisting of five external members with technical backgrounds in aquaculture and fisheries development.

- Developed and successfully launched an RFA process. The Fish Innovation Lab received over 240 concept notes and 39 full proposals. The full proposals were reviewed, and the final selection was completed by October 22, 2019.

- Developed a Fish Innovation Lab communications program, which includes a website, social media presence, quarterly newsletter, video production, and process for working with research project principal investigators (PIs) to develop success stories. The team also developed United States for International Development (USAID)-required project documents, including the Monitoring, Evaluation, and Learning (MEL) Plan and the Environmental Monitoring and Mitigation Plan (EMMP).

- Developed a Fish Innovation Lab learning program, which includes monthly principal investigator (PI) and ME Partner meetings and quarterly virtual platform meetings. The Fish Innovation Lab facilitated three virtual platform meetings that were well attended and resulted in a lively exchange of technical knowledge and practical experience among PIs. Guidance was provided on cross-cutting themes, and increased alignment on the definition of research-for-development was developed. Platform meetings focused on capacity building; nutrition sensitivity; gender and youth mainstreaming; and collaborating, learning, and adapting (CLA). Content was structured around USAID guidance and policies, provided clarity on relevant conceptual frameworks, and prompted discussions on the implications of these themes for the impact of Fish Innovation Lab-funded activities.

III.   Key Accomplishments

Research and capacity-building progress in Year 1 is based on the Quick Start projects. In Year 1, Quick Start projects operated for approximately six months, with most launching activities in March 2019. Their achievements on three out of four core indicators are described below:

- EG.3-2: Number of individuals participating in United States Government (USG) food security programs

     o   Year 1 Result: 250 individuals (28 male and 222 female; 132 youth and 118 non-youth)

Results for FY19 for EG.3-2 reflect the activities of five Quick Start projects at the end of FY19 (before completion of project activities). Each of the five projects engaged a team of researchers, including 13 youth research assistants and representing gender-balanced teams. One Quick Start project provided nutrition status assessments to the children of 200 female caregivers (the majority of whom were youth caregivers) in Kenya as part of data-collection activities. One Quick Start project engaged stakeholders in participatory planning activities, including stakeholders from government, civil society, private sector, and aquaculture producers. Roughly half the stakeholders were female. Additional participants for at least one Quick Start project are likely to be added in FY20.

- EG.3.2-7: Number of technologies, practices, and approaches under various phases of research, development, and uptake as a result of USG assistance

     o   Year 1 Result: Two (2) in Phase I – Under Research (1 in Plant and Animal Improvement; 1 in Production Systems); One (1) in Phase II – Field Testing (1 in Social Science)

Three technologies, practices, or approaches were under research in FY19. In Bangladesh, in the area of plant and animal improvement, genome sequencing and identification of SNP markers were conducted, which will lead to genetic improvement of rohu. In Zambia, in the area of production-systems research, using SCP to replace fish meal in tilapia feed was investigated. In Zambia, in the area of social science research, the acceptability of fish powder for a nutritional supplement for women and children was assessed.

- EG.3.2-24: Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance

o   Year 1 Result: 23 individuals (22 in Civil Society Organizations; 1 in Private Sector Firms)

Each of the five Quick Start projects engaged a team of researchers who had the opportunity to engage directly in the development and application of research methods for improving management practices and technologies. Research teams included 13 youth research assistants and represented gender-balanced teams. Research teams included 17 individuals from research and educational institutions, five from non-profit organizations, and one from a private sector firm.

The fourth indicator, EG.3.2-29: Number of organizations with increased performance improvement with USG assistance, will be reported at the close of Quick Start project activities in the FY20 semiannual report. The indicator name and definition were updated for FY20, so all reporting on this indicator will be aligned with the new version.

IV.   Fish Innovation Lab Overview and Structure

Funded by USAID, the Fish Innovation Lab aims to reduce poverty and improve nutrition, food security, and livelihoods in developing countries by supporting the sustainable development of aquaculture and fisheries. To achieve these goals, the Fish Innovation Lab supports research and capacity-building activities targeting three program areas:

1. **Advancing productivity:** The Fish Innovation Lab works to identify and develop scalable technologies and practices that enhance opportunities for prosperity, nutrition, and resilience in aquaculture and fisheries, with the overarching objective to enhance food and nutrition security. This includes developing innovations to increase achieved yield of fish in aquaculture, improving availability and nutritional quality of feed (especially removal of fish meal and fish oil), improving genetics and reliability of fish seed, and enhancing sustainable fisheries management to improve harvest yields and increase reliability.

2. **Reducing and mitigating risks:** These Fish Innovation Lab activities identify and develop scalable technologies and practices that promote resilience and mitigate food security risks, especially through improved fish and environmental health. This includes increasing the tolerance of fish to biotic and abiotic stresses (including ecological resilience), improving diagnostic capabilities, maintaining healthy and bio-secure production environments, and reducing pre- and post-harvest losses (including ensuring food safety).

3. **Improving human outcomes:** This Fish Innovation Lab program area generates evidence on how to sustainably and equitably improve economic opportunity, nutrition, and resilience in aquaculture and fisheries value chains, households, and communities. This includes identifying how aquaculture and fisheries can help improve nutrition and market opportunities (especially for vulnerable populations), equitable access to production assets (especially for women and youth), and establishing an enabling environment for fish production.

Rationale for Aquaculture and Fisheries

Fish are a nutrient-rich and highly traded food commodity; as such, they are a unique global resource that offers opportunity for the Feed the Future Initiative to accomplish the goals of the Global Food Security Strategy for sustainable and equitable agriculture-led economic growth, strengthened resilience in people and systems, and improved nutrition—particularly for women and children. In the developing world, more than 2.6 billion people depend on aquaculture products and captured fish for more than 20% of their total animal protein — and in the Feed the Future countries of Bangladesh, Cambodia, Ghana, Sierra Leone, and Indonesia, fish constitute over 50% of animal protein intake (FAO, 2018. The State of World Fisheries and Aquaculture 2018 - Meeting the sustainable development goals. Rome. License: CC BY-NC-SA 3.0 IGO). To meet the growing demand for food and quality protein (especially animal source protein), reduce potential conflicts over natural resources, and ensure equitable access to fish in developing countries, innovations are needed in both aquaculture and fisheries to foster sustainable, resilient, inclusive, and profitable production and marketing systems.

The aquaculture and fisheries sectors are important to global food security because:

1. **Fish provide high-quality animal protein and micronutrients**, including vitamins A, B12, zinc, iron, and selenium. In many of the Feed the Future countries (examples listed above), fish are the primary source of animal protein; thus, increased consumption of fish and/or fish products has potential to reduce childhood stunting and improve brain development and function.

2. **Fish are one of the most widely traded agricultural commodities worldwide**; increased trade (local and regional) has potential to improve livelihoods and increase incomes.

3. **Aquaculture and fisheries provide formal and informal employment opportunities for women and youth.**

4. **Aquaculture enables diversification of farming systems** through opportunities such as integrated aquaculture, providing increased economic resilience for producers.

Fish Innovation Lab Pillars

The Fish Innovation Lab funds **research for development**, which generates knowledge, innovations, and technologies and transfers information and innovations to stakeholders for achievement of impacts. Research for development requires scientific rigor, awareness of local context, and building of relationships to enable adoption and scaling. It is not an abstract quest for fundamental knowledge and the improvement of scientific theories, nor is it the straightforward delivery of goods and services associated with development work.

Fish Innovation Lab strategies are based on these pillars:

1. **Technology Innovations:** Innovative technologies to advance aquaculture and fisheries production result from productive collaborations among universities, private industry, government research agencies, and producers.

2. **Behavior Change:** Effective implementation of sustainable aquaculture and fisheries often requires voluntary behavioral changes among producers and fishers to comply with best practices. Socioeconomic research, therefore, is often required to determine the best methods to change behaviors.

3. **Value Chain Linkages:** Small-, medium-, and large-scale farms require linkages and support from private investors and industries up and down the value chain. Infrastructure development for industries to support producers (e.g., feed mills, seed stock production, harvesting and hauling equipment and services, and processing plants) is necessary for sustainable aquaculture development.

4. **Local Capacity Development:** Ensuring local institutional capacity that endures beyond Fish Innovation Lab-sponsored activities is achieved most effectively by building capacity in partner organizations. One of the Fish Innovation Lab's goals is to build cooperative learning programs that foster two-way learning and the exchange of ideas and expertise between U.S. universities and international partners.

V.   Theory of Change and Results Framework

The Fish Innovation Lab theory of change posits that: **If** innovative technologies from universities and non-governmental organizations (NGOs) are more effectively developed and transferred to aquaculture producers and commercial support industries (particularly in feed and seed production), aquatic animal health and biosecurity capacity is effectively engaged to support aquaculture, behavior changes in producers and fishers are adopted to use sustainable practices, and equitable access to fish markets is enabled for fish producers and consumers, **then** goals of improved profitability and sustainability in fish production, increased resilience to cope with disease outbreaks and other threats, and more nutritious diets for vulnerable individuals (especially children and women) can be realized.

All Fish Innovation Lab activities connect to this theory of change and include three approaches, as specified in the Fish Innovation Lab results framework:

1. **Research for development.** Increased end-user aquaculture and fisheries research results promote sustainable, resilient intensification of production systems, enhance food safety and nutrition, increase trade and domestic market opportunities, and contribute to responsible aquatic resource management.

2. **Capacity building.** Projects result in increased capacity of local partners to independently generate and transfer fish-related knowledge, technologies, and practices to beneficiaries.

3. **Adoption of innovation and scaling.** Projects yield increased adoption of new technologies and practices, as well as other innovations.

Goals and Objectives

The overarching goal of the Fish Innovation Lab is to alleviate poverty and improve nutrition through reliable provision of fish, a nutrient-rich animal source food. Like all Feed the Future Innovation Labs funded by USAID, the Fish Innovation Lab will reach its goal by supporting a research for development program that will be composed of competitive subawards, commissioned research, and collaborations with international partners (universities, NGOs, private sector, and governmental research agencies). Buy-ins and associate awards will be used to extend Fish Innovation Lab activities and expand countries that are reached. The Fish Innovation Lab ME will implement activities that align to the following three objectives:

1. Advance aquaculture and fisheries productivity

2. Reduce and mitigate risks to aquaculture and fisheries

3. Improve human outcomes from the aquaculture and fisheries sector

These three objectives align with Fish Innovation Lab's three areas of inquiry, which are the focus of the Fish Innovation Lab research for development and capacity building programs. In Year 1, the activities undertaken within these objectives are being implemented as Quick Start projects.

VI. Research Project Reports (Quick Starts)

Analysis of the Aquaculture Post-harvest Chain in Nigeria

U.S. PI: Julius A. Nukpezah, PhD, Mississippi State University
U.S. Co-PI: Joe Steensma, EdD, MPH, Washington University in St. Louis
HC PI: Tran Van Nhuong, PhD, WorldFish

Description: This project aims to improve the contribution of aquaculture fish to the diet and household incomes of the Nigerian people, including poor and vulnerable women and children. This activity will build on available data from public- and private-sector partners. It will map the aquaculture value chain in Nigeria, covering accessible important geographies. Geographic Information System tools will be combined with field assessments using mobile data-collection tools to better understand current aquaculture post-harvest chain structure, efficiency, and key market constraints. This aquaculture post-harvest assessment will complement current work conducted by the BMGF and WorldFish, and it will identify opportunities for designing investments for improving the overall contribution of aquaculture to the well-being of the people of Nigeria, including poor and vulnerable women.

Objectives: The goal of the project is to conduct a comprehensive analysis of the aquaculture post-harvest chain of Nigeria to better understand the fate of harvested fish from production to consumption. The specific objectives are to

1. Identify technologies and practices that provide income growth and improve diets, including post-harvest loss reduction.
2. Identify and map the aquaculture market systems that improve productivity and reduce post-harvest losses of aquaculture fish.
3. Identify gaps in the aquaculture post-harvest sector in Nigeria.

Achievements: The cold chain analysis team organized and facilitated two workshops in Nigeria in January 2019, with 22 participants total from universities, research institutions, the public and private sectors, including WorldFish, BMGF, Commonwealth Scientific and Industrial Research Organization, and MSU, as well as experts from local institutions. The first workshop was held at the International Institute of Tropical Agriculture (IITA) headquarters in Ibadan January 8-11, with 15 participants; the second workshop was held at the Hilton Transcorp in Abuja January 15-16, with 31 participants. Most of the participants attended both workshops. The workshops, which were organized by WorldFish, developed a research methodology and the project workplan. A secondary objective was to build consensus among project stakeholders. Following the development of data-collection instruments and methodologies, the Quick Start team also organized a training workshop on survey tools for enumerators and supervisors on sampling design, use of online tools, and qualitative focus group-discussion methods. In total, 37 enumerators and nine supervisors were trained in how to use online data collection tools for survey implementation. As of September 30, 2019, 1,699 individuals have been interviewed in eight selected states in five regions. The Quick Start team also participated in a workshop aiming to develop a case study on the implementation of a new human and institutional capacity development tool in September 2019.

Lessons learned: Judging from the workshops organized in Nigeria, the Quick Start team has learned that local university and research institution partners have the capacity to identify and resolve challenges in aquaculture production in Nigeria. Collaborating with existing institutions will contribute to increased adoption of aquaculture technologies introduced to farmers along the value chain. Furthermore, partnering with international nonprofit organizations, such as BMGF, via a project implemented by WorldFish provided the synergies to accomplish more than the project would have if it were acting alone in Nigeria. Collaborating with other agencies with different missions and goals provides lessons in managing boundaries to achieve bigger goals.

Presentations and publications: None

Assessing Facilitators and Barriers to Aquaculture and Fish Consumption in Zambia (Fish4Zambia)

U.S. PI: Kathleen Ragsdale, PhD, Mississippi State University
U.S. Co-PI: Mary Read-Wahidi, PhD, Mississippi State University
U.S. Co-PI: Elin Torell, PhD, University of Rhode Island
HC PI: Lauren Pincus, PhD, WorldFish
HC Co-PI: Pamela Marinda, PhD, University of Zambia

Description: Fish provide essential micronutrients and contribute to a diversified diet for millions of people in Zambia, yet undernutrition is a serious problem in the country, where 40% of children under the age of five are stunted. Fish are a unique animal-source food that is rich in protein and essential fatty acids. Small fish have particularly high levels of micronutrients, especially in the bones, head, and gut. Because small fish are often eaten whole, they provide high nutritional benefits, especially for pregnant and lactating women and children in the first 1,000 days. Research to assess how small fish reach vulnerable household members (e.g., infants/children, pregnant/lactating women) in Zambia is lacking. Fish4Zambia outputs include 1) an assessment of existing fisheries enterprises disaggregated by key actors' gender and age to assess existing barriers and bridges to women- and youth-led fisheries development to pinpoint leverage points for growing this sector and 2) a fish-flow study of actors' engagement across the fish value chain (i.e., as producers, processors, marketers, and consumers). Results will inform the Fish Innovation Lab-supported post-harvest value chain activities, the USAID Zambia Mission, and the Government of Zambia investments in fisheries. Fish4Zambia contributes to Feed the Future objectives to understand why many Zambians (particularly women and children) continue to lack dietary diversity and remain vulnerable to food insecurity and malnutrition.

Objectives: Fish4Zambia aims to increase the quality/quantity of fish benefitting nutrition and food security in Zambia, especially for women and children in the first critical 1,000 days of life. Objectives include the following:

1. Assess the current state of small fish (e.g., kapenta and chisense) capturing, processing, and trading activities from point of catch through processing to local and distant markets for sale in both rural and urban areas.

2. Identify the social and gender barriers to entry and/or participation in these value chain activities for the different actors, particularly women and youth.

3. Assess how small captured fish are accessed by different consumer groups and consumed within households, especially in households in rural and urban areas distant from their source of production.

4. Explore the potential of upgrading the small fish value chain via improving processing, storage, and trading methods to reduce post-harvest losses and improve food safety.

5. Explore the use of small dried fish for further processing into fish powder and incorporating into locally appropriate foods for enhanced nutrition of women and children in the first 1,000 days of life.

Achievements: Fish4Zambia PIs and co-PIs held a kick-off meeting on March 22, 2019. Through bi-weekly and weekly meetings, the team finalized a number of research instruments, which were submitted to and received approval from the MSU Institutional Review Board (IRB) as well as the UNZA Ethics Review Committee, including

- Women's Empowerment in Fisheries Index (WEFI)

- Fish4Zambia Focus Group Discussion (FGD) Guide for Men and Women (Ages 30+ Years)

- Fish4Zambia FGD Guide for Youth (Ages 18-29 Years)

- Fish4Zambia Key Informant Interview (KII) Guide for Ministry of Health (MoH)-NGO

- Fish4Zambia KII Guide for Ministry of Fisheries and Livestock (MoFL)

In July 2019, the data-collection tools were implemented in the Samfya District in Zambia. The team collected data via 397 WEFI surveys, seven men's FGDs, nine women's FGDs, seven youth FGDs, two MoH-NGO KIIs, and one MoFL KII. In the last quarter, the team set up databases for the data collected, conducted a preliminary analysis of the WEFI surveys, and began developing the Fish4Zambia preliminary results report.

Lessons learned: Nothing to report

Presentations and publications:

1. Marinda, P., & Ragsdale, K. (2019, September). Talent is universal; Opportunity is not: Why gender equity and youth inclusion are vital for aquaculture and fisheries development. Presentation at the Feed the Future Innovation Lab for Fish Virtual Platform Meeting.

2. Kolbila, R., Ragsdale, K., Marinda, P., Read-Wahidi, M. R., Pincus, L., & Torell, E. (2019, October). Using Fish4Zambia preliminary results to explore food insecurity among men and women in Zambia's Lake Bangweulu region. Presentation at the Mississippi State University Graduate Research Symposium, Mississippi State, MS.

3. Ragsdale, K., Marinda, P., Read-Wahidi, M. R., Pincus, L., & Torell, E. (2019). *Fish4Zambia trip report: July 14-July 28.* Mississippi State, MS.

Genome Sequencing and Development of SNP Markers from Rohu in Bangladesh

U.S. PI: Attila Karsi, PhD, Mississippi State University
U.S. Co-PI: Dan Peterson, PhD, Mississippi State University
HC PI: Md. Samsul Alam, PhD, Bangladesh Agricultural University
HC Co-PI: Md. Akhtaruzzaman Khan, PhD, Bangladesh Agricultural University
HC Co-PI: John Benzie, PhD, WorldFish
HC Co-PI: Matthew Hamilton, PhD, WorldFish

Description: Bangladesh is an excellent example of the contribution of aquaculture to food security and livelihoods due to the importance of fish as a dietary source of protein and micronutrients. As the second most important aquaculture species in Bangladesh, rohu carp accounted for about 13% of the total production of fish from ponds in 2016-2017 (Department of Fisheries, 2017. Fisheries Statistical Yearbook of Bangladesh 2016–17. Fisheries Resources Survey System, DOF, Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh, Dhaka). Polyculture practices have incorporated carps, such as rohu, for many years and recently have included combinations with small indigenous fishes. Improvements in broodstock selection are needed to increase the productivity of rohu. Broodstock selection has been initiated, and family lines have been developed at WorldFish, but the evaluation of beneficial traits is needed to optimize and accelerate targeted family development. This project is identifying challenges, possibilities, and needs of aquaculture in Bangladesh. Direct outputs include the evaluation of broodstock development, a high-quality genome sequence of rohu, and the identification of genome-wide SNP markers for broodstock selection programs. The research will be beneficial for informing selective breeding for additional carp species, such as silver carp and catla carp, and it will enable assessment of species impacts on pond productivity, which will reduce poverty and improve food security in Bangladesh.

Objectives: The research goal is to improve aquaculture production and the livelihoods of farming communities in Bangladesh and surrounding regions using sustainable approaches. The objectives of this Quick Start project, which will allow attainment of our long-term goal, are to

1. Establish collaborations and conduct stakeholder surveys

2. Conduct sequencing of the rohu (*Labeo rohita*) genome

3. Identify genome-wide SNPs

Achievements: *Objective 1: Establish collaborations and conduct stakeholder surveys.* The Quick Start project PI, co-PI, and collaborators participated in virtual Fish Innovation Lab meetings (platform, MEL, and PI meetings). The team developed a stakeholder survey questionnaire and focus group-discussion guide to collect farm-level data. The Bangladesh team obtained IRB approval for the survey instruments, and thereafter a draft stakeholder survey was pre-tested with five rohu farmers and finalized. Three graduate students were selected as enumerators and trained for two days. The survey was conducted by visiting 184 rohu farmers and 31 hatchery owners from the Mymensingh, Rajshahi, and Jashore regions. Data entry of the surveys completed by rohu farmers and hatchery owners is underway.

Objective 2: Conduct sequencing of the rohu genome. After obtaining Institutional Animal Care and Use Committee (IACUC) approval, researchers at Bangladesh Agricultural University collected blood samples from five male rohu carp and shipped the samples to the Institute for Genomics, Biocomputing and Biotechnology (IGBB) at MSU. The blood yielded high-quality DNA that was prepared for sequencing. Using Oxford Nanopore long-read sequencing, a rohu genome sequence was computationally assembled into scaffolds. The sequences of the assemblies were then improved by comparing the scaffolds with high-coverage, short-read sequences produced using an Illumina sequencer. Currently, a chromatin configuration sequencing technique called "Hi-C" is being used to join scaffolds into pseudomolecules (i.e., chromosomes). Bionano Optical mapping will be used to correct assembly mistakes and improve the quality of pseudomolecule assemblies.

Objective 3: Identify genome-wide SNPs. The genotyping by sequencing (GBS) analysis for SNP development is being optimized at the IGBB. After completion of genome sequencing and GBS work, bioinformatics analysis will be conducted for SNP discovery.

Lessons learned: Nothing to report

Presentations and publications: None

Improve Nutrition Among Vulnerable Populations in Kenya Through Increased Access to and Consumption of Sustainable Fish Foods (SecureFish)

U.S. PI: Lora Iannotti, PhD, Washington University in St. Louis
U.S. Co-PI: Austin Humphries, PhD, University of Rhode Island
U.S. Co-PI: Terezie Mosby, PhD, Mississippi State University
HC PI: Andrew Wamukota, PhD, Pwani University
HC Co-PI: Elizabeth Kamau-Mbuthia, PhD, Egerton University

Description: Kenya has food insecurity; 47% of the population lives below the poverty line, and 26% of children under the age of five are stunted (The World Bank, 2015. Prevalence of undernourishment (% of population). Available from: http://data.worldbank.org/indicator/SN.ITK.DEFC.ZS). Coastal marine fisheries are chronically overexploited, and this can be seen in the four-fold decrease in catch for coastal fisheries since the 1980s (Samoilys, M. A., Osuka, K., Maina, G. W., & Obura, D. O., 2017. Artisanal fisheries on Kenya's coral reefs: decadal trends reveal management needs. *Fisheries Research* 186:177-191). Nationally representative data indicate low dietary diversity in vulnerable groups, and only a small fraction of young children (21%) were reported to consume any fish, meat, or poultry. Some of the most vulnerable people to malnutrition and micronutrient deficiencies are those along Kenyan lakes and coastlines, including infants and young children, pregnant and lactating women, and school-aged children living in poor households. Here, small-scale fishing has large-scale implications because it is essential to well-being via nutrient-rich food. This project will advise subsequent research initiatives to improve human welfare and nutrition using improved approaches to increase access to and consumption of coastal marine fish as food. Outcomes include a comprehensive inventory of coastal marine fish for food that maintain ecosystem functioning and address micronutrient deficiencies in vulnerable groups. It will yield insights into current household fish consumption and social dynamics in low-income households. The market analysis outputs will guide research on coastal marine fish species with potential as micronutrient sources, which will improve access and safety of household consumed coastal marine fish.

Objectives: This project aims to build a foundation for the Fish Innovation Lab goal to improve nutrition among vulnerable populations in Kenya through increased access to and consumption of sustainable fish as food from coastal marine fisheries. This Quick Start aims to

1. Identify nutritious coastal marine fish for food that maintain ecosystem functioning

2. Assess the acceptability and feasibility of these fish as foods for nourishing vulnerable populations of pregnant and lactating women, and young children

3. Determine market conditions for ensuring availability, affordability, and safety of these coastal marine fish as food

Achievements: The SecureFish U.S. and host country PIs and co-PIs met in Nairobi and traveled to Mombasa for a study initiation visit January 17-February 2nd, 2019. There were two objectives during this visit: 1) contact Kenyan government and NGO officials involved in the fisheries and aquaculture sector to solicit input on the research objectives and 2) begin the Quick Start project activities along the coast. The team met with local leaders in Kwale, Mombasa, and Kilifi counties. The team submitted and received IRB approval from each of their respective institutions (i.e., Pwani University; WUSTL, URI, Egerton University, and MSU), and the team applied for and received a research permit from the Kenyan governmental agency National Commission for Science, Technology, and Innovation.

Objective 1. Identify nutritious coastal fish for food that maintain ecosystem functioning. Meetings with key contacts from government agencies and NGOs revealed there is high priority placed upon developing offshore fisheries. Challenges exist across the entire value chain, but stakeholders emphasized there is no capacity for fish processing in Kenya.

Objective 2. Assess the acceptability and feasibility of these fish as foods for nourishing vulnerable populations. The team organized their experimental design around Beach Management Units (BMUs); they met with leaders of each BMU who facilitated discussions with fishers, fish traders, and households with small children. The Quick Start team adapted their planned survey questionnaire to incorporate information collected through dozens of such interviews. The

team also visited a local health clinic to discuss nutrition communication in the villages and better understand health treatment norms. Following the finalization of data-collection tools, data were collected (both fish marketing and household surveys) at four fishing communities (Vipingo, Uyombo, Shimoni, and Tiwi) and adjacent communities. The team also conducted KIIs with community leaders and government officials. The nutrition assessments conducted during household surveys adhered to the following process:

1. Consent from caregiver was sought.

2. Interview was done for the caregiver using the tool, and dietary diversity for the child was determined using a 24-hour recall and food-frequency questionnaire.

3. The caregivers' height and weight were taken.

4. The child's height/length and weight were taken.

Objective 3. Determine market conditions for ensuring availability, affordability and safety of these coastal marine fish as food. No activities to date.

Lessons learned: Nothing to report

Presentations and publications:

1. Lawrence, M. (2019, September). Improved nutrition security through increased access to and consumption of fish. Presentation at the Annual Meeting of the Feed the Future Innovation Labs, Washington, DC.

2. Iannotti, L. (2019). Innovative approaches to nutrition: sustainable animal source foods. Innovative Approaches to Address Nutritional Challenges in Sub-Saharan Africa, *Africa Speak* seminar series, Washington University in St. Louis, September 10, 2019. St. Louis, MO.

Replacing Fishmeal with Single-Cell Proteins in Tilapia Oreochromis niloticus Diets in Zambia

U.S. PI: Delbert Gatlin, PhD, Texas A & M University
HC PI: Rodrigue Yossa, PhD, WorldFish
HC Co-PI: Rose Komugisha Basiita, PhD, WorldFish

Description: Several ingredients have been investigated as alternatives to fishmeal in commercial aquatic animal feeds to support the sustainable growth of aquaculture globally. These alternative ingredients include, but are not limited to, insect meals and single-cell protein (SCP). SCP can be composed of yeast, bacteria, algae, or a combination. Zambia is unique in sub-Saharan Africa because it has high-quality, locally produced commercial tilapia feed from Skretting Zambia and Aller Aqua Zambia feed mills, which are both located in Siavonga next to Lake Kariba. The commercial tilapia feed in Zambia uses soy and fishmeal as protein sources; replacement of fishmeal has the potential to increase profitability and sustainability of tilapia aquaculture in Zambia. This Quick Start activity will evaluate the potential of replacing fishmeal in tilapia diets with SCP products developed by Meridian Biotech, a U.S. company. Two products will be evaluated: MRD-Pro, which is a bacterial product, and DY-Pro, which is a yeast product. The Quick Start project will provide data to determine which product provides improved nutrition for tilapia and optimal levels of fishmeal replacement by evaluating growth, survival, nutrient utilization, and condition factor in tilapia. It will further determine potential health benefits of the SCP products by evaluating effects on gut health. This project will also provide institutional capacity development for Natural Resources Development College (NRDC) in Lusaka by improving facilities and building faculty expertise, and it will provide individual capacity development for participating NRDC faculty and students.

Objectives: The purpose of this study is to investigate the effect of partially or totally replacing fishmeal by SCP ingredients in a tilapia (*Oreochromis niloticus*) commercial feed.

The specific objectives are

1. To study the effect of partial or total replacement of fishmeal by SCPs on the growth, survival, nutrient utilization, condition factor, and gut health in tilapia

2. To estimate the optimum level of substituting fishmeal with SCPs in tilapia diets

3. To determine which of the two SCP products tested is more appropriate for tilapia nutrition

Achievements: Since its inception, the Quick Start project has obtained IACUC approval from MSU. Feed formulation was conducted in October 2019. The SCP ingredient was shipped from Meridian Biotech to Texas A&M University in October 2019. Fishmeal is being shipped to Texas A&M University from Aller Aqua Zambia (via WorldFish Zambia) in November 2019, and the production of feed is being done in November 2019. The Quick Start team is working with the staff of NRDC to purchase materials required to improve the aquaria and laboratory facility in November 2019. It is anticipated that the fish trial experiment will start in December 2019.

Lessons learned: When there is no established and functional animal ethics committee in the host country, the investigators should consider applying for IACUC approval at the institution where the U.S. PI is affiliated. This may reduce delays in getting the research approved by a local animal ethics committee and allow the project to progress smoothly.

Presentations and publications: None

VII.   Associate Award Research Project Reports

There were no associate awards under The Fish Innovation Lab in FY19.

VIII.   Human and Institutional Capacity Building

Human and Institution Capacity Development (HICD) Toolkit Case Study

The Fish Innovation Lab participated in discussions with USAID and the International Food Policy Research Institute (IFPRI) regarding use of one of the Fish Innovation Lab Quick Starts as a case study for a USAID capacity development toolkit, which is part of the Capacity Development for Agricultural Innovation Systems (CDAIS) program development for Africa. The toolkit allows stakeholders to identify capacities that are lacking in an agricultural sector and formulate an agenda for strengthening capacity and building an innovation network. As a result of the discussions, the Nigeria Cold-Chain Analysis Quick Start was chosen as the case study. A workshop on capacity development in the aquaculture sector in Nigeria was organized at IITA, in Ibadan, Nigeria. It was facilitated by the University of Michigan, IFPRI, and partners who jointly developed the capacity-development toolkit. The Nigeria Cold Chain Analysis Quick Start U.S. PI Dr. Julius Nukpezah, U.S. Co-PI Dr. Joe Steensma, and WorldFish scientist Dr. Rohana Subasinghe participated as resource persons and co-facilitators of the two-day workshop held on September 3 and 4, 2019. Fish Innovation Lab MEL Advisor Joanna Springer participated and represented the Fish Innovation Lab ME Partners. The overall purpose of the workshop was to provide key aquaculture stakeholders in the South West zone of Nigeria with a strategic agenda and action plan for capacity development that will enable development of an innovative and thriving aquaculture sector. The expected output of the workshop includes a strategic outline of the capacity-development agenda for systemic innovation in the aquaculture sector of the South West zone that draws on the experience of the participants facilitated by the capacity-development toolkit.

Table 1. Short-Term Trainings

Country of Training	Brief Purpose of Training	Who was Trained[1]	Number Trained[2]		
			M	F	Total
Bangladesh	Acquaint enumerators with the survey schedule and train them on how to conduct effective interviews	Enumerators (students)	4	0	4

Country of Training	Brief Purpose of Training	Who was Trained[1]	Number Trained[2]		
			M	F	Total
Kenya	Train enumerators on fish marketing as well as household/caregiver field data collection and data management	Enumerators (students)	2	2	4
Nigeria	Train enumerators to use electronic data-collection tools to conduct quantitative surveys on fish farm performance, post-farmgate value chain actors, and fish consumption in eight selected states; train supervisors on sampling, data collection, and data management procedures	Supervisors and enumerators	26	20	46
Zambia	Train enumerators on the Women's Empowerment in Fisheries Index (WEFI) and data collection methods and train facilitators on the focus group discussion instrument and facilitation methods	Enumerators (Zambia Department of Fisheries) and facilitators (students)	5	5	10

[1] Such as farmers, government officials, women entrepreneurs

[2] Disaggregated by sex if known

Long-Term Trainings

Although the Fish Innovation Lab involved a number of undergraduate and graduate students in its activities, none of them received funding from the Quick Start projects in FY19. Thus, there are no long-term trainings to report for FY19.

Institutional Capacity Development

There are no institutional capacity building results to report for FY19.

Implementation of Other Cross-Cutting Themes

The Fish Innovation Lab has four cross-cutting themes: gender equity and youth engagement, nutrition, resilience, and capacity development. FY19 highlights related to gender, nutrition, and resilience include:

- **Gender equity:** One of the issues explored by the Fish4Zambia Quick Start is gender inequities in fish consumption and hunger in Zambia. An initial analysis of survey data found that women (68.6%, n = 140) were significantly more likely than men (54.4%, 105) to report Hunger Event 1[2] ($p=0.004$). Women (64.2%, 131) were significantly more likely than men (44.6%, 86) to report Hunger Event 2[3] ($p<0.0001$). Women (49%, 100) were significantly more likely than men (29%, 56) to report Hunger Event 3[4] ($p<0.0001$).

- **Gender equity:** Dr. Kathleen Ragsdale (MSU) collaborated with Dr. Pamela Marinda (UNZA) on a presentation, "Talent is Universal; Opportunity is Not: Why Gender Equity and Youth Inclusion are Vital

[2] Hunger Event 1 is how often in the past four weeks there was no food to eat of any kind in your house due to lack of resources to get food.

[3] Hunger Event 2 is how often in the past four weeks you or any household members went to sleep hungry because there was not enough food.

[4] Hunger Event 3 is how often in the past four weeks you or any household members went a whole day and night without eating because there was not enough food.

for Aquaculture and Fisheries Development" for a Fish Innovation Lab Platform Meeting on September 27, 2019. This presentation included a question–answer session and a group discussion facilitated by Dr. Elin Torell (URI) and Ms. Joanna Springer (RTI).

- **Gender equity:** In Bangladesh, about 1.4 million women depend on fish for their livelihoods through fishing, aquaculture, fish handling, and processing. A survey conducted by the Bangladesh Quick Start team revealed that more than 80% of laborers engaged in the fish processing industries are women. Women play a critical role in every link of the value chain in small-scale fisheries. Women's participation in fish farming was observed primarily as household-based fish farming, where carp is the main species. In addition, recently educated young people become fish farmers because it is more profitable than agriculture.

- **Resilience**: The ME Partners provided feedback for proposals to align their cross-cutting resilience strategies with USAID's definition of resilience. Once the selection process is completed, the team will advise successful applicants of any necessary revisions to adequately address the theme of resilience in program design, monitoring and evaluation (M&E), and implementation.

- **Nutrition**: The Kenya Quick Start project performed a rapid assessment of coastal fisheries using nutrition and health measures as well as economic and ecological indicators that contribute to sustainability from existing data. The goal was to identify fish foods that meet three criteria: 1) provide high-quality nutrition, 2) maintain ecosystem structure and functioning, and 3) are economically affordable and safely provided in markets. Consequently, the team collected primary data from marine fishery communities in Kilifi and Kwale counties of Kenya. The purpose was to understand current attitudes, behaviors, and perceptions around fish consumption among vulnerable groups. Data collection was completed in FY19, and the analysis will be concluded in the first half of FY20.

- **Nutrition**: The Bangladesh Quick Start project focused on the preference and consumption of rohu by fish farmers and consumers. Furthermore, it will assess the contribution of rohu to fulfill nutritional requirements. This is important because fish is the most important animal-source food in Bangladesh and approximately 60% of the population eats fish at least every other day. Approximately 63% of animal protein in the diets of Bangladeshis comes from fish.

IX. Innovation Transfer and Scaling Partnership

Innovation Transfer

Nothing to report

Scaling Partnerships

Replacing Fishmeal with Single Cell Proteins in Tilapia *Oreochromis niloticus* Diets in Zambia: This Quick Start project features a public-private partnership to promote adoption and scaling of the research findings. The private industry partners (Meridian Biotech, Aller Aqua Zambia, and Yalelo) each contribute to the project, and they each have interest in potential adoption based on research results. An overview of the project workflow is shown in Figure 2. Meridian Biotech is providing the SCP ingredient, Aller Aqua Zambia is providing the fish feed base mash, and Yalelo is providing the tilapia. The research is conducted by Texas A&M University, Natural Resources Development College, and WorldFish.
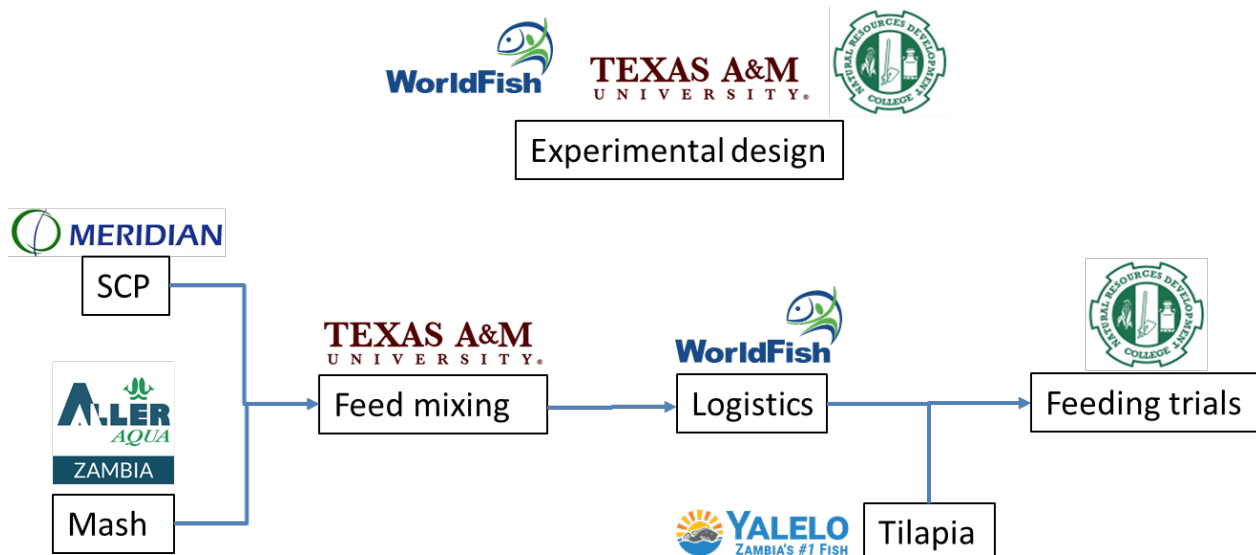
Figure 2: Zambia fishmeal Quick Start scaling partnership schematic

X.   Environmental Management and Mitigation Plan

The Fish Innovation Lab EMMP has been approved by the bureau environmental officer on July 8, 2019. Information specific to each of the research projects selected for funding through the Fish Innovation Lab RFA will be added to the EMMP, and it will be resubmitted to the agreement officer's representative (AOR) and bureau environmental officer for final feedback and approval.

XI.   Open Data Management Plan

The Fish Innovation Lab ME worked with the Quick Start teams to explain the data management plan. The Quick Start teams are all prepared to submit their data once they have completed their data collection, analysis, and publication of results.

XII.   Management Entity and Partner Activities

The Fish Innovation Lab ME implements its research portfolio to achieve knowledge and technology adoption, scaling, and impact. Important activities completed in Year 1 were developing and implementing the first competitive RFA process, forming the Fish Innovation Lab EAB, obtaining approval for the Fish Innovation Lab MEL plan and EMMP, hiring of ME positions, defining roles of ME personnel, and developing and implementing a communications program.

Assessment of local and regional critical gaps that limit scaling of aquaculture and fisheries. During the first quarter of 2019, the Fish Innovation Lab ME engaged with local stakeholders to assess the status of the aquaculture sector in Nigeria and Bangladesh. For Nigeria, a face-to-face stakeholder meeting was conducted by the Nigeria Quick Start project in Abuja in January 2019. In addition, three stakeholder meetings were organized by the USAID Nigeria Mission and conducted by conference calls with the Fish Innovation Lab director in March 2019 (one for academia, one for NGOs, and one for industry). For Bangladesh, stakeholder feedback was collected from producers, universities, and government stakeholders by the Fish Innovation Lab country coordinator via email and phone.

The Fish Innovation Lab planned to conduct a platform meeting in one target country (Bangladesh) in mid-2019. The goal of the Fish Innovation Lab platform meeting was to enable direct stakeholder feedback as well as introduce the Fish Innovation Lab and projects in the region. On the advice of the Fish Innovation Lab's AOR, the platform meeting was postponed for two primary reasons: 1) personnel at the USAID Bangladesh Mission are in transition, and the new personnel would not be in place in summer 2019 and 2) the AOR and Bangladesh Mission suggested

planning the Fish Innovation Lab platform meeting after Fish Innovation Lab research results are ready for dissemination.

Identification of collaborative teams of experts to conduct needed research to fill critical knowledge gaps through a competitive RFA process. The cornerstone of the Fish Innovation Lab ME will be a competitively awarded research portfolio. The research portfolio will address critical knowledge gaps that prevent scale-up of aquaculture and fisheries and limit poverty alleviation and food security. In Year 1, the Fish Innovation Lab developed and implemented an RFA that combined all three areas of inquiry into a single RFA. The RFA, which included concept note and full proposal stages, was released in April 2019. The RFA was designed under the theory of change with input from experts in relevant technical areas and cross-cutting themes. It encouraged integrated, creative approaches from globally eminent researchers. To ensure a competitive process, the RFA was distributed widely through the Fish Innovation Lab website, the Fish Innovation Lab mailing list, and listservs to reach U.S. universities, as well as qualified universities and NGOs in target countries.

The Fish Innovation Lab ME developed a web-based submission and review system for the RFA process in collaboration with Piestar, Inc., and the ME was responsible for maintaining security and confidentiality of documents throughout the routing and review processes. The RFA competition took place in two stages, beginning with a concept note stage. A total of 247 concept notes were received in Piestar. These concept notes were screened for scope and fit with the Fish Innovation Lab theory of change. Based on the rigid concept-note-review process, which involved select ME Partners and USAID staff, 42 teams were invited to submit full proposals. The Fish Innovation Lab received a total of 39 full proposals by the deadline. During the concept note and full proposal stage, a formal process was conducted whereby applicants submitted written questions about the RFA, and written responses from the Fish Innovation Lab ME were posted publicly. The full proposal stage also included an informational webinar for the teams invited to submit a full proposal.

Implement knowledge management plan. The Fish Innovation Lab uses the Piestar platform for collecting, organizing, and monitoring data from research activities, as well as sub-awardee activities and achievements. RTI worked closely with MSU and the Piestar team to tailor its platform for Fish Innovation Lab's reporting and MEL needs. This process involved setting up and assigning reporting responsibilities, emailing campaign calendars, and preparing the data-entry forms for indicators and semiannual reporting. RTI supported the Piestar training for PIs and worked one-on-one with researchers to resolve issues and clarify how to navigate the system.

A Fish Innovation Lab communications strategy was developed in Year 1, and the strategy was implemented on the various outlets through which communication would be managed and disseminated. For each outlet, the communications manager and Fish Innovation Lab team members developed content, visual identity, and analytics mechanisms to inform end users for growth or improvement. These outlets include print media, such as flyers, informational cards, and banners; and digital media, such as the website, social media, email newsletter, videos, and a photo library. In addition to setting up the platforms themselves, the communications manager built a data-management structure for communications file storage, cataloging the photo library, and instituting an analytics strategy for major communications outputs, such as newsletters, social media, and web stories.

Another key accomplishment for communications was the development of templates and guidelines to ensure the integrity and ethical use of Fish Innovation Lab knowledge and communications. As the Fish Innovation Lab grows, these should help foster a unified voice and identity for the Fish Innovation Lab as well as streamline PI and ME Partner activities when working on behalf of the Fish Innovation Lab. Though these have had a soft launch with ME Partners in Year 1, the communications manager will be providing comprehensive training to ME Partners and PIs in Year 2 following the announcement of funded projects from the RFA.

Monitoring, evaluating, and learning from research findings, determining factors that limit adoption of new knowledge/technologies, and scaling. The Fish Innovation Lab ME Partners participated in a facilitated session led by RTI to flesh out impact pathways for each of the three Fish Innovation Lab areas of inquiry. The impact pathways provide the basis for cross-project learning and review of the Fish Innovation Lab's theory of change. They will be further developed over the life of the project.

A MEL plan for the Fish Innovation Lab was developed and approved by the USAID AOR in the second quarter of FY19. The MEL plan follows guidance specific to the USAID Bureau for Food Security and incorporates the standard elements of a MEL plan, including a section about CLA.

The Fish Innovation Lab selected four core indicators from Feed the Future standard indicators that will apply to Quick Start projects and all future subawards. The MEL advisor developed performance indicator reference sheets (PIRS) by tailoring the standard Feed the Future PIRS and discussed the indicators in-depth with each Quick Start team. RTI held multiple phone/Skype consultations with PIs and co-PIs from each Quick Start team, followed up by email exchanges, to set targets and document the rationale or justification for each target. The targets were entered in the Feed the Future Monitoring System (FTFMS) in a timely manner, although the targets continued to be updated in discussions with the Quick Start teams as planning progressed. A final set of targets were incorporated into the finalized MEL plan in February. The targets were then further reviewed and discussed with Quick Start teams as their agreements were finalized. The MEL advisor has maintained a tracking sheet with updates to target estimates and target rationales for future reporting.

RTI provided two two-hour orientation sessions for Quick Start teams involving a presentation of MEL for USAID and facilitating cross-team discussion of MEL-related approaches and experiences. RTI met as needed with Quick Start teams to discuss plans for tracking participants and advising on data needs for FTFMS reporting.

The Fish Innovation Lab organized a series of two-hour virtual platform learning meetings. The platform meetings were designed to allow the grantees to share lessons learned related to the Fish Innovation Lab areas of inquiry and strengthen integration of cross-cutting themes into programming. The first meeting focused on capacity development, the second discussed nutrition, and the third focused on gender equity. The meetings included formal presentations by Fish Innovation Lab topical experts, facilitated dialogue, and group discussion. For example, the gender equity discussion highlighted experiences from the Fish4Zambia Quick Start team and was designed to build internal capacity among Fish Innovation Lab collaborative partners on the importance and interconnectedness of gender equity and youth inclusion for expanding aquaculture and fisheries development. Particularly important was seeking to expand bench scientists' notions of how to recruit and retain female scientists and ethnic minority and other disadvantaged scientists into programs and trainings. The virtual platform meetings also included an administrative session for Quick Start PIs. The Fish Innovation Lab ME Partners conducted weekly virtual meetings from September-December 2018 during the kickoff phase. Starting in January 2019, the ME Partners conducted monthly virtual meetings. Monthly Fish Innovation Lab team meetings were also held with Quick Start PIs.

Management Entity – MSU-Specific Activities

Dr. Lawrence provided direction and oversight for all Fish Innovation Lab activities. Dr. Lawrence coordinated the Fish Innovation Lab ME and ME Partners. Dr. Lawrence served as the primary contact for the Fish Innovation Lab AOR and represented the Fish Innovation Lab at meetings and activities. Dr. Lawrence facilitated collaboration with current and potential research partners. The following meetings and activities were attended:

1. Annual Meeting of the Feed the Future Innovation Labs (Washington, DC, September 11-12, 2018).

2. Fish Innovation Lab kickoff meeting (Washington, DC, October 9-11, 2018). Fish Innovation Lab Director, ME, and ME Partners met with the Fish Innovation Lab AOR, agreement officer (AO), and other USAID experts.

3. Startup Inception and Planning Workshops for the WorldFish, BMGF, and MSU partnership projects in Nigeria (Abuja, Nigeria, January 14-17, 2019). The Fish Innovation Lab director gave an overview of the Fish Innovation Lab and participated in the stakeholder feedback workshop and project planning sessions with WorldFish.

4. Aquaculture 2019, Annual Meeting of the World Aquaculture Society. (New Orleans, LA, March 7-11, 2019). The Fish Innovation Lab director promoted the Fish Innovation Lab and distributed information to scientists and companies potentially interested in applying for competitive grants.

5. WorldFish – USAID Knowledge Sharing Session. (Washington, DC, May 30, 2019). The Fish Innovation Lab Director participated in the session and gave a presentation entitled, "Feed the Future Innovation Lab for Fish: Advancing the fish value chain and human nutrition."

6. Visit to Zambia Quick Start project sites, implementing partners, and potential collaborators. (Lusaka and Siavonga, Zambia, August 6-9, 2019). The Fish Innovation Lab Director, Fish Innovation Lab Program Manager, and AOR toured Aller Aqua Zambia (feed mill) and Yalelo (tilapia farm), and met with Mr. Bryan McCoy (CEO Yalelo) and Mr. Adam Taylor (CEO Aller Aqua Zambia). Kariba Harvest (tilapia farm) was visited, and a meeting was held with Permit Shava (General Manager). UNZA was visited, where the Fish Innovation Lab ME team met with Dr. Pamela Marinda, HC co-PI for Fish4Zambia Quick Start project, and Prof. Bernard Mudenda Hang'ombe, fish health scientist collaborating with Kariba Harvest. The aquaculture lab at NRDC that is the site for the Zambia Fishmeal Replacement Quick Start project was visited, and the Fish Innovation Lab ME met with Mr. Emmanuel Masautso Sakala, who will oversee fish trials for the project. WorldFish Zambia was visited to meet with Dr. Rose Komugisha Basiita, HC co-PI for the Zambia Fishmeal Replacement Quick Start project. A briefing of Fish Innovation Lab activities in Zambia was held at the USAID Zambia Mission.

7. Annual Meeting of the Feed the Future Innovation Labs (Washington, DC, September 17-18, 2019). The Fish Innovation Lab director gave two presentations: 1) "Replacing fishmeal with single-cell proteins in tilapia feed" (in the Opportunities for Partnership with USAID Implementing Partners and the Private Sector panel session) and 2) "Improved Nutrition Security through Increased Access to and Consumption of Fish" (in the Nutrition Innovations & Impacts session).

Dr. Ragsdale provided feedback and edits for Fish Innovation Lab guiding documents such as the communication strategy and copy for the website. Dr Ragsdale provided Fish4Zambia preliminary results to the Fish Innovation Lab for presentation at the Annual Meeting of the Feed the Future Innovation Labs, September 17-18, 2019, Washington, DC. Furthermore, she collaborated on a presentation, "Talent is Universal; Opportunity is Not: Why Gender Equity and Youth Inclusion are Vital for Aquaculture and Fisheries Development" for the Fish Innovation Lab virtual platform meeting on September 27, 2019. Dr. Ragsdale regularly liaised with Kristen Dechert on Fish Innovation Lab communications pieces, including feature articles, blogs, and a video, related to the Fish4Zambia Quick Start project.

Dr. Allen advocated and increased awareness for the Fish Innovation Lab at the World Aquaculture Society Meeting in New Orleans, Louisiana. He assisted in disseminating information on the Fish Innovation Lab and making contacts with aquaculture scientists for the Fish Innovation Lab RFA. Dr. Allen assisted in the preparation, submission, and approval process for an IACUC protocol for the Zambia Fishmeal Replacement Quick Start project, which was approved. Dr. Allen also assisted in facilitation of the Bangladesh Quick Start project by bringing parties together, making contacts, and providing technical insight.

Ms. Hill assisted the Director and ME Partners in planning, organizing, and managing Fish Innovation Lab activities, as well as developing the initial documents required by USAID such as the work plan, branding and marking plan, Quick Start project descriptions, and EMMP.

Ms. Dechert built the infrastructure for communications for the Fish Innovation Lab, including the website, newsletter, templates, photography guidelines, and internal communications platform for Fish Innovation Lab staff and partners to use. Additionally, she handled dissemination of the RFA and assisted with the responses to questions. She has shared several news releases and stories and developed materials used by the director for presentations at meetings.

Activities Undertaken by In-Country Coordinators

Dr. Hussain, Asia regional coordinator, implemented the following activities in FY19:

1. Developed a distribution list of potential researchers from nine public universities, the Bangladesh Fisheries Research Institute, WorldFish, and NGOs

2. Outlined country priorities; drafted and submitted a technical report entitled "Aquaculture and Fisheries Sector in Bangladesh: Overview and Government Priorities"

3. Undertook preparations for a platform meeting in Bangladesh, which was planned for August 2019 but postponed upon feedback from USAID

4. Supported proposal-development teams in Bangladesh. After the RFA announcement came out, Dr. Hussain contacted universities, research institutions, and departments to encourage submission of concept notes and organize discussion meetings. As a result, 18 concept notes were submitted from Bangladesh.

5. Facilitated connections between U.S. and Bangladesh investigators during the RFA process

6. Coordinated regularly with the MEL advisor and the Bangladesh Quick Start team to assist in monitoring progress as it related to indicator reporting

Dr. Wamukota, East Africa regional coordinator, focused his efforts on supporting the Kenya Quick Start project. As such, he supported the field data collection and data analysis in Kenya.

ME Partner – URI

During the first year of the Fish Innovation Lab, URI supported the Fish Innovation Lab ME by accomplishing several tasks:

1. Supported the establishment and implementation of five Quick Start projects. The Fish Innovation Lab deputy director provided continuous technical input to the Fish4Zambia quick start, including providing feedback on research protocols, surveys, and interview guides. Dr. Humphries, who is the East Africa specialist and Kenya Quick Start project U.S. co-PI, provided oversight to all projects in Zambia and Kenya. He traveled to Kenya in July to work on the Quick Start and coordinate Kenya activities with in-country Kenya coordinator Dr. Wamukota.

2. Supported the development of MEL and communications plans, provided feedback during the Fish Innovation Lab Piestar system development, and led the development of the Fish Innovation Lab EMMP.

3. Supported the development and implementation of the Fish Innovaiton Lab RFA. This included reviewing and selecting concept notes for scope and fit, organizing a feedback session for PIs, and reviewing the full proposals.

4. Organized virtual platform meetings: the URI team worked with RTI and MSU to develop and implement the three virtual platform meetings. This included working with RTI and cross-cutting theme leads to develop short presentations and discussion questions for the participants.

5. Human and Institution Capacity Toolkit Case Study: participated in discussions with USAID and IFPRI regarding the opportunity of showcasing one of the Fish Innovation Lab Quick Start projects as a case study in a USAID capacity-development toolkit. The toolkit was later implemented using the Fish Innovation Lab Quick Start in Nigeria.

6. Participated in the first Fish Innovation Lab EAB meeting as well as the Annual Meeting of the Feed The Future Innovation Labs, which was held in Washington, DC, in September 2019.

7. Supported RTI in implementing the Fish Innovation Lab MEL plan, including Quick Start project learning and quarterly indicator reporting.

8. Supported the development of the Fish Innovation Lab Year 2 work plan and semiannual/annual reports.

ME Partner – RTI

RTI conducted the following activities:

1. Developed area of inquiry impact pathways: RTI facilitated the ME in preparing impact pathways for each of the three Fish Innovation Lab areas of inquiry: productivity, risk mitigation, and human outcomes.

2. Development of a MEL plan: RTI wrote a MEL plan, solicited and incorporated feedback from MSU and URI, and finalized the plan for submission to the Fish Innovation Lab director.

3. Development of indicators: RTI worked with the ME and ME Partners to select four core indicators from Feed the Future standard indicators, tailored the standard Feed the Future PIRS, and discussed indicators in-depth with each Quick Start team.

4. Indicator target-setting: RTI held multiple consultations with PIs and co-PIs to set targets and rationales. A final set of targets was incorporated into the finalized MEL plan in February. RTI has maintained a tracking sheet with ongoing updates to estimates and rationales for future reporting.

5. Guidance on indicator tracking: RTI met as needed with Quick Start teams to discuss plans for tracking participants and advising on data needs for FTFMS reporting.

6. Tailoring and launching the Fish Innovation Lab Piestar platform: RTI worked closely with MSU and the Piestar team to tailor the generic Piestar platform for Fish Innovation Lab's reporting and M&E needs.

7. MEL orientation for Quick Start teams: RTI provided two MEL orientation sessions for Quick Start teams involving a presentation of M&E and learning for USAID and facilitating cross-team discussion of MEL-related approaches and experiences.

8. Development of RFA: RTI supported the ME and ME Partners in finalizing the RFA. This included providing technical input on MEL and resilience sections.

9. Organization of the virtual platform meetings: RTI worked with URI and MSU to develop and facilitate the three virtual platform meetings on March 19, June 28, and September 27. Presentations from cross-cutting team leads were solicited, and discussions were facilitated on nutrition, gender equity, and youth engagement. Feedback was solicited on virtual platform meeting content and format, responses were provided, and detailed meeting minutes and additional resources to all participants were provided.

10. RTI delivered a three-day grants-management training and provided communications advising and review of deliverables.

11. Compiled, synthesized, and edited Quick Start and ME Partner contributions to the semiannual report.

12. Reviewed and contributed to selection of 42 concept notes to be invited for full proposals.

13. Reviewed and contributed to selection of 14 full proposals to be considered for funding.

14. Provided facilitation support, input, and feedback on a workshop in Ibadan, Nigeria that was part of the USAID-funded CDAIS activity. The workshop was held September 3-4, 2019, hosted by WorldFish and IFPRI. RTI attended and contributed to session planning, facilitation, and feedback on methods and tools used, alongside researchers from the Nigeria Cold Chain Quick Start project.

15. Provided orientation and review of progress on achieving targets with Quick Start projects and ME partners via webinar September 26th.

ME Partner – TSU

Dr. Dey coordinated various activities for the Fish Innovation Lab in Bangladesh and supervised the Asia regional coordinator, Dr. Hussain. During this reporting period, Dr. Dey:

1. Established informal communications with various high-ranking government officials in Bangladesh (including Minster for Agriculture, Minster for Fisheries and Livestock, Senior Member of the Planning Commission Dr. M. Shamsul Alam, and Director General of the Bangladesh Fisheries Research Institute).

2. Informed various government officials, researchers from various universities (including Bangladesh Agricultural University, Patuakhali Science and Technology University, and Sylhet Agricultural University) and NGOs about the Fish Innovation Lab goals, objectives, and plans.

3. Consulted stakeholders in Bangladesh (policy makers, researchers, and NGO officials) to update national priorities for aquaculture and fisheries research in the country.

4. Helped with initiating and implementing the Quick Start project in Bangladesh.

5. Reviewed existing literature on aquaculture and fisheries research in Bangladesh. This included 41 papers covering a diverse range of topics related to the aquaculture and fisheries sectors of Bangladesh. An annotated bibliography is being prepared, which will be used as a background paper for the Bangladesh platform meeting.

6. Established linkage between researchers in Bangladesh (from Bangladesh Agricultural University, Jashore University of Science and Technology, Patuakhali Science and Technology University, Sylhet Agricultural University, and University of Dhaka) and Nigeria (Ekiti State University) regarding entrepreneurship-driven aquaculture value chain development.

7. Established professional network between researchers in Bangladesh and the United States and facilitated formation of research teams, resulting in submission of 18 concept notes and six full proposals to the Fish Innovation Lab .

8. Supervised the preparation of the following three background papers on aquaculture and fisheries in Bangladesh:

- Inland Aquaculture Development in Bangladesh: Past Trend and Future Strategies: Dr. M. A. Mazid.
- Markets, Institutions and Government Policies on Aquaculture and Fisheries in Bangladesh: Dr. Shamsul Alam.
- Strategies for Sustainable Development and Management of Marine Fisheries in Bangladesh: Dr. Shahadat Hussain.

ME Partner – WUSTL

As a Fish Innovation Lab ME Partner, Dr. Iannotti primarily provides technical inputs regarding nutrition and food security, a cross-cutting theme of the Fish Innovation Lab projects. During this first year of the Fish Innovation Lab, she supported the ME throughout the initial planning and implementation stages. The contributions included

1. Participated in Fish Innovation Lab ME meetings

2. Provided technical inputs regarding Fish Innovation Lab impact pathways, theory of change, and M&E indicators

3. Attended October 2018 Fish Innovation Lab kickoff meetings with USAID in Washington, DC

4. Delivered nutrition training for Fish Innovation Lab ME, ME Partners, and project PIs and co-PIs during the June 28 virtual platform meeting

5. Supported dissemination activities internally among the Fish Innovation Lab, as well as externally to the academic community and policy makers.

Dissemination activities included developing nutrition-related slides for Dr. Lawrence's presentation at the Annual Meeting of the Feed The Future Innovation Labs, presenting at a Congressional advocacy meeting on Capitol Hill in Washington, DC, highlighting the work of the Fish Innovation Lab in presentations at the University of California Davis Aligning the Food System conference, and representing the Fish Innovation Lab during a panel presentation at WUSTL entitled "Innovative Approaches to Address Nutritional Challenges in Sub-Saharan Africa." Finally, Dr. Iannotti has initiated a project to examine the global situation of fisheries in relation to human consumption and nutrition more broadly. She is currently compiling data from various sources including the United Nations Food and Agriculture Organization, Demographic and Health Surveys, United Nations Children's Fund, World Bank, and Sea Around Us, among others, to understand relationships across economic, environmental, and nutritional factors regarding fish.

XIII.   Communications

The Fish Innovation Lab ME implemented several internal and external communications activities through its knowledge management plan. The communications goals are to 1) build awareness of the Fish Innovation Lab and research results, and 2) facilitate internal communication among new and existing stakeholders to drive learning and networking. To work toward these goals, the Fish Innovation Lab implemented the following communications activities:

1. Oriented Quick Start PIs on the communications strategy, expectations, and branding requirements

2. Facilitated and managed the Slack workspace for internal communication and team building

3. Developed videos for three Quick Start projects

4. Developed a website and social media presence

5. Produced a quarterly newsletter

6. Showcased the Fish Innovation Lab during events and on social media, blogs, and other channels. This included developing short features related to the Fish Innovation Lab's gender work for Feed the Future Week in September.

7. Used the Fish Innovation Lab website as a conduit for distributing news releases and communications materials, including the Fish Innovation Lab RFA

Website, Newsletter, Social Media, and Video

For knowledge dissemination, the Fish Innovation Lab website was developed and released in March 2019. Since initial release, several pages, including pages for projects, news, blogs, resources, and partners have been added to improve knowledge dissemination and user experience.

The Fish Innovation Lab released its first newsletter in July 2019. This newsletter was sent to 543 subscribers via Mail Chimp, and from that dissemination has garnered 746 total opens to date. Additionally, it earned 111 impressions and two engagements on Facebook. The September 2019 issue of the newsletter was sent to 590 subscribers and has been opened 483 times. To date, this newsletter has received 422 impressions and 10 engagements on Facebook. The Fish Innovation Lab also disseminated a special newsletter for Feed the Future Week with three stories, and this newsletter has been opened 441 times. It made 843 impressions and earned 22 engagements on Facebook. Additionally, the stories were shared widely on Twitter by Feed the Future and others.

The Fish Innovation Lab launched its social media presence to coincide with the release of its first newsletter in July 2019 and has seen a steady increase in social media traffic and followers, website traffic, and newsletter subscribers, a snapshot of which is shown in Figure 3. The Fish Innovation Lab uses analytics platforms to gauge traffic, especially for knowledge dissemination sections of the website, such as the news and blog pages. The spikes shown in September coincide with Feed the Future Week, demonstrating effective participation and ability to have stories recognized by the broader development community.
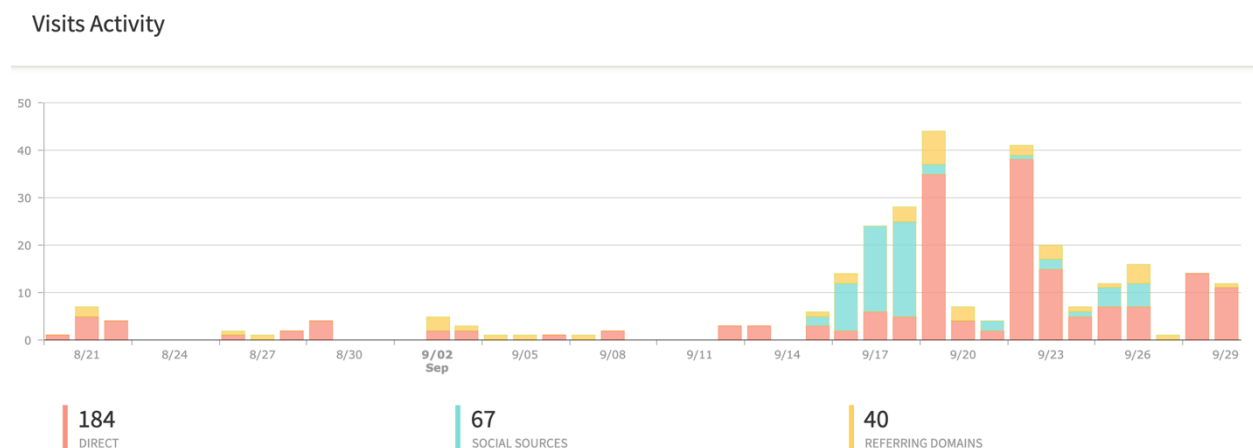

Figure 3. Fish Innovation Lab social media visit activity in August-September 2019.

The Fish Innovation Lab is active on [Twitter](#) and [Facebook](#), posting three to five times each week and regularly gaining likes and shares. A goal for the coming is year is to grow the following of the Fish Innovation Lab on social media, especially with ME Partners and PIs/co-PIs, who can share the content with their institutions and networks so that the knowledge can be more widely disseminated.

The lab also uses [YouTube](#) for hosting and sharing videos, which are additionally posted on the Fish Innovation Lab [website](#). During this year, the Fish Innovation Lab produced two videos, one about the [Nigeria](#) Quick Start project and another about the two [Zambia](#) Quick Start projects. In the coming year, videos are planned for the Kenya and Bangladesh Quick Start projects, as well as about the Fish Innovation Lab as a whole.

Distribution of the Fish Innovation Lab Request for Applications (RFA)

The Fish Innovation Lab RFA was shared on the Fish Innovation Lab website, Agrilinks, MSU newsroom web page, and Piestar, and it was disseminated to 26 listservs and contact groups. Additionally, the RFA was disseminated via Mail Chimp to the Fish Innovation Lab's database of contacts (316 at the time of disseminating the RFA). At the time of this report, there have been 10,053 opens of the Mail Chimp RFA dissemination, and the Fish Innovation Lab gained 169 new subscribers in the weeks immediately following the dissemination, indicating it was shared widely by initial recipients.

Top Stories and Content Highlights

Below are the major stories the Fish Innovation Lab has shared or earned during Year 1:

- **[MSU to Lead New USAID Feed the Future Innovation Lab on Fish](#).** This initial news release announced the Fish Innovation Lab to the MSU community and was shared widely across MSU networks. (September 12, 2018)

- **[With MSU CVM at the Table, Fish to Help Alleviate World Hunger.](#)** This feature story focused on the Fish innovation Lab and Dr. Lawrence and was published in *Pegasus Press*, the magazine of the MSU College of Veterinary Medicine. (December 2018)

- **[Fish Innovation Lab Awards $500,000 in 'Quick Start' Grants.](#)** This news release announced and summarized the five Quick Start projects supported by the Fish Innovation Lab. At the time of this report, it has been picked up by four media outlets. (March 22, 2019)

- **[Global Stakeholders Convene to Discuss Progress on Early Research by MSU-Based Fish Innovation Lab.](#)** This story discussed the Fish Innovation Lab's first virtual platform meeting of the ME, ME Partners, and project PIs and co-PIs. At the time of this report, it has been picked up by one media outlet. (April 25, 2019)

- **[Student Scholar to Assist with Research in Zambia.](#)** This short feature is about an MSU undergraduate student who received university funding to join the Fish4Zambia Quick Start project for the summer of 2019. (May 15, 2019)

- The Fish Innovation Lab was featured during the **[Observations segment](#)** on WMSV, the MSU radio station. (June 4, 2019)

- **[Team Begins Initial Field Work in Kenya.](#)** This feature highlighted stakeholder meetings and initial data collection by the SecureFish Quick Start team. (June 5, 2019)

- **[Global Partners Discuss Nutritional Goals at Virtual Convening.](#)** This story discussed the Fish Innovation Lab's second virtual platform meeting of ME, ME Partners, and project PIs and co-PIs. (July 23, 2019)

- **[Fish Innovation Lab Director Discusses Aquaculture Biosecurity at Congressional Briefing.](#)** This story covers Dr. Lawrence's participation in the Congressional briefing on antimicrobial resistance jointly hosted by the Food and Agriculture Organization of the United Nations and the MSU Global Center for Aquatic Food Security. Versions of this story have appeared in at least three outlets. (July 23, 2019)

- **[Identifying Barriers to Nutrition in Zambia's Lake Bangweulu Fishing Camps.](#)** This story discusses research and preliminary findings for the Fish4Zambia Quick Start team following several weeks of field research. (August 30, 2019)

- Three stories were produced and disseminated for Feed the Future Week: **[Elin Torell](#), [Annie Mumba,](#)** and **[Mbonyiwe Chakanga](#)**. As discussed above, these were widely shared on social media by many outlets and individuals. (September 16-20, 2019)

- **[Hilsa Shad Fishery Success in Bangladesh.](#)** This blog post, written by M. Gulam Hussain, the Asia regional coordinator for the Fish Innovation Lab, highlights the research efforts Bangladesh has taken over the past 40 years to improve its fisheries management. This post has been extremely successful with nearly 350 views on Facebook, and is an inspiration for future posts to facilitate this type of knowledge sharing. (September 27, 2019)

XIV.   Issues and General Lessons Learned

Establishment of the Fish Innovation Lab RFA

The Fish Innovation Lab's ME learned several lessons related to the development and implementation of the RFA process:

1. Given the large interest and response, it was a good idea to include a concept note step during the request for application process.
2. The full proposal stage could have been simplified and several required annexes, such as the conflict of interest annex, could have been removed.
3. The full proposal review process could have been facilitated by development of a panel of qualified experts to serve as external reviewers prior to the full proposal deadline.
4. A list of countries where the Fish Innovation Lab will not fund research should have been included in the RFA.

Regional Coordinators

Given the changes in countries where the Fish Innovation Lab is implementing Quick Start projects compared to the originally proposed countries in its response to the Notice of Funding Opportunity, the Fish Innovation Lab ME has learned to be adaptable to changes in needs for in-country regional coordinators. In particular, the Fish Innovation Lab has not filled a position for in-country management of West Africa activities. Originally, the Fish Innovation Lab had planned on hiring a regional coordinator located in Ghana, but because the initial Quick Start activity is located in Nigeria, the team does not yet have an active in-country coordinator for West Africa.

Learning Activities

During Year 1 work planning, the Fish Innovation Lab recognized that due to budget considerations, it is not feasible to bring all PIs to a foreign country every year to share results and lessons learned. The ME also recognized that the primary purpose of the in-country meetings is to engage regional stakeholders and promote adoption and scaling of Fish Innovation Lab findings. Therefore, the best opportunity and venue for Fish Innovation Lab-level learning is at the annual management meeting for U.S. PIs.

The Fish Innovation Lab will use the quarterly virtual platform meetings as opportunities for Fish Innovation Lab-level learning with participation of all PIs. The team will use one of these virtual meetings to prepare for the learning agenda activities that RTI will facilitate at the U.S. PI meeting. To execute the Fish Innovation Lab-level learning agenda, the Fish Innovation Lab will need to gather input from regional in-country meetings, U.S. PI meetings, and virtual meetings. This will be possible if at least one full day at in-person meetings is set aside to conduct activities and prepare deliverables planned in the learning agenda.

General Coordination Among Research Teams

Coordination amongst members of research teams is critical to successful MEL, including target-setting, indicator tracking, and reporting. For this reason, RTI began to incorporate an element of coordination into target-setting and target review meetings to ensure all members of the team have the same information as it relates to MEL. The Fish Innovation Lab MEL advisor identified that dissemination of the Fish Innovation Lab theory of change, impact pathways, and application of cross-cutting themes requires additional focus and effort. For this reason, the Fish Innovation Lab ME and ME Partners will make these central to virtual platform meetings and the annual PI meeting, and the ME and ME Partners will orient learning activities and the learning agenda around these core components of the Fish Innovation Lab's technical design.

Measuring Outcomes Versus Impacts

One lesson learned through the virtual platform meeting discussions and the review of proposals is that researchers may not always make a clear distinction between hypothesized impacts/outcomes of interventions and the outcomes they expect to set targets for and be held accountable to. The ME will have to emphasize these distinctions in the finalization of the new awards and ensure clear wording is used to distinguish research questions and proposed variables for analysis from results that will be delivered through the awards.

Issues Related to Individual Quick Start Projects

1. The Nigeria Quick Start project integrates into a bigger project being supported by the BMGF and implemented by WorldFish. Thus, the timeline for the Quick Start project required coordination with the BMGF project. Furthermore, because of the high security threat in some Nigeria states, the Quick Start research focuses in states with lower security risk.

2. Several Quick Start projects experienced a delay in issuing the subawards to partner institutions. As a result, most of the Quick Start projects began in Quarter 3 of FY19. Delays were caused by DUNS number problems with some institutions and regulatory compliance approval delays.

XV.   Future Work

The next steps for the Quick Start projects in implementing their work plans are as follows:

Research Activities
Cold Chain Analysis in Nigeria (project period ends December 20, 2019)   • Finalize data collection   • Conduct data analysis   • Produce a project report
Fish4Zambia (project period ends March 15, 2020)   • Clean and finalize data sets   • Analyze results   • Create presentations and other results disseminations

• Draft a final project report

Rohu Carp Genome Sequencing in Bangladesh (project period ends February 28, 2020)

- The Bangladesh team will compile and analyze survey data

- The MSU team will complete genome sequencing

- The MSU team will complete the SNP identifications and develop SNP markers

- Release the rohu carp genome in public databases and prepare project report

SecureFish in Kenya (project period ends December 31, 2019)

- Analyze data collected in FY19

- Conduct site visits in November 2019

- Maintain communication with team through WhatsApp and monthly Zoom calls

- Draft final project report

Fish Meal Replacement in Zambia (project period ends March 31, 2020)

- Finalize protocol and feed formulations

- Upgrade the fish facility

- Process the feed

- Conduct the fish experiment

- Conduct intermittent sampling and final sampling

- Prepare and ship samples to MSU

- Perform lab analysis

- Draft final project report

The next step for the ME and ME Partners in implementing the annual Work Plan are as follows:

Management Activities

Management Entity – MSU

1. For projects selected for funding through the competitive RFA, the Fish Innovation Lab ME will review and approve revised project descriptions and budgets. Project descriptions and budgets will be submitted to the AOR and AO for approval.

2. The Fish Innovation Lab ME will ensure financial accountability of research subawards. The Fish Innovation Lab ME will coordinate with the MSU Office of Sponsored Projects to issue subawards to institutions funded through the competitive RFA.

3. The Fish Innovation Lab anticipates obligating approximately $6-6.5 million of the Fish Innovation Lab research budget in these funded projects. Anticipated project sizes will range from $200,000 to $650,000 over 2-4 years with approximately 12-14 projects awarded.

4. To support Year 2 Fish Innovation Lab activities, members of the ME will travel to countries to attend Fish Innovation Lab-related stakeholder and implementation meetings, meet with PIs and in-country coordinators, and visit research sites.

5. The ME will conduct a virtual meeting for all PIs and co-PIs for projects funded through the competitive RFA. USAID and Fish Innovation Lab rules and policies will be reviewed with all participants.

6. The ME will conduct an annual meeting in the US. The ME, ME Partners, AOR, EAB, and all subaward PIs will be invited. Subaward PIs will be required to include a travel budget to attend the annual meeting in their subaward budgets.

7. Dr. Peter Allen will continue to provide technical aquaculture expertise as needed, support IACUC regulatory compliance of projects, and work to provide technical assistance to ensure productivity of projects.

8. Dr. Kathleen Ragsdale will continue to provide gender impacts and youth engagement expertise as needed.

9. Ms. Kristen Dechert will continue leading the Fish Innovation Lab communication efforts with website and social media maintenance, content generation and dissemination for quarterly newsletters, and feature articles. She also will maintain templates and other internal communications documents.

ME Partner – URI

1. Support the final selection and award of full proposals, including the development of work plans, MEL plans, and environmental monitoring and mitigation protocols (where applicable)

2. Support the development of virtual platform meetings, the annual Fish Innovation Lab meeting, and a regional platform meeting

3. Support the finalization of the Nigeria HICD toolkit case study

4. Work with the ME to develop a plan for how to use in-country and regional coordinators to maximize learning

5. Identify successful methodologies, technologies, and extension strategies implemented by Fish Innovation Lab grantees and identify bottlenecks that limit scale-up of aquaculture and fisheries

6. Support the development of social media, technical briefs, and other extension materials that can be distributed to a broader stakeholder base

7. Showcase the Fish Innovation Lab at conferences and other events where Fish Innovation Lab results and lessons can be highlighted

8. Oversee and provide technical assistance to East and West Africa research activities

9. Oversee and support research activities related to small-scale fisheries, resilience, and HICD

10. Contribute to work planning and reporting

ME Partner – RTI

1. Provide guidance on subaward indicators, targets, resilience approaches, and metrics

2. Facilitate a learning agenda workshop and M&E training for subawardees and ME Partners.

3. Collaborate with the deputy director, Dr. Torell, to provide targeted evaluation support for Quick Start tools and methods

4. Identify subawards for targeted supplementary outcome assessments; define methodology and conduct baseline data collection and analysis for supplemental measures

5. Provide ongoing virtual and in-country M&E support to sub-awardees

6. Provide ongoing facilitation of virtual platform meetings and implement the Fish Innovation Lab learning agenda

<u>ME Partner – TSU</u>

1. Help finalize three background papers on aquaculture and fisheries in Bangladesh

2. Assist in completing and disseminating results from the Quick Start project on Genome Sequencing and Development of Single Nucleotide Polymorphism (SNP) Markers from Rohu in Bangladesh

3. Support initiating new projects being started by the Fish Innovation Lab in Bangladesh

<u>ME Partner – WUSTL</u>

1. Continue to participate in Fish Innovation Lab ME Partner meetings and attend any in-person and virtual meetings as they arise

2. Support and provide technical assistance regarding nutrition and food security to Quick Start projects and any new projects funded in FY20

3. Participate in dissemination activities including making contributions to Fish Innovation Lab presentations, the Fish Innovation Lab newsletter, and integrating the Fish Innovation Lab work into presentations at nutrition conferences such as the American Society for Nutrition conference in 2020

XVI. Appendices

List of Awards

Research projects:

Genome Sequencing and Development of Single Nucleotide Polymorphism (SNP) Markers From Rohu in **Bangladesh**. Lead PI: Attila Karsi, Mississippi State University. Award: $99,999.

SecureFish: Improved Nutrition Security in **Kenya** through Increased Access to and Consumption of Coastal Marine Fish. Lead PI: Lora Iannotti, Washington University of St. Louis. Award: $100,000.

From Harvest to Plate: An Analysis of the Aquaculture Post-Harvest Chain in **Nigeria**. Lead PI: Julius A. Nukpezah, Mississippi State University. Award: $99,964.

Replacing Fishmeal with Single Cell Proteins in Tilapia *Oreochromis niloticus* Diets in **Zambia**. Lead PI: Delbert Gatlin, Texas A & M University. Award: $99,999.

Fish4Zambia: Assessing Facilitators and Barriers to Aquaculture and Fish Consumption in **Zambia**. Lead PI: Kathleen Ragsdale, Mississippi State University. Award: $99,879.

Publications – Nothing to report

Data Management – Nothing to report