



FEED THE FUTURE

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

FishFirst! Zambia: Research for Development and Scaling Staple-Fish Products for Enhanced Nutrition in the First 1,000 Days of Life

Fish Innovation Lab

Final Technical Report: 1 July 2020 – 15 July 2023

Cooperative Agreement 7200AA18CA0030



USAID
FROM THE AMERICAN PEOPLE



MISSISSIPPI STATE UNIVERSITY™
GLOBAL CENTER FOR AQUATIC
HEALTH AND FOOD SECURITY

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FishFirst! Zambia Partners/Institutions

- **U.S. Lead:** Social Science Research Center, Mississippi State University (Phase I-III)
- **In-Country Lead:** WorldFish Zambia (Phase I-III)
- **Additional Partner Institutions:**
 - University of Rhode Island (Phase I)
 - University of Zambia (Phase I)
 - Washington University in St. Louis (Phase II-III)
- **Tiered In-Country Partners** with whom we are working to establish collaborations to scale ComFA+Fish at the national/regional level (e.g., to school feeding programs in Zambia and sub-Saharan Africa), district level, and village level include:
 - **TIER 1. National/Regional Level**
 - Ministry of Health, Republic of Zambia
 - Ministry of Fisheries and Livestock, Republic of Zambia
 - Muntanga Mapani MD – Executive Director, National Food and Nutrition Commission of Zambia
 - Chisela Kaliwile PhD – Principal Nutritionist, National Food and Nutrition Commission of Zambia
 - Sylvia Banda – CEO, Sylva Food Solutions (see Technical Brief, pg. 35)
 - **TIER 2. District Level** (Gwembe, Siavonga, and Sinazongwe Districts): Government personnel and mid-level entrepreneurs/business owners, including:
 - Geoffrey Jakopo – District Commissioner, Siavonga
 - Adidja Sumbwe MD – District Health Director, Siavonga
 - Twaambo Mandeva – District Nurse, Gwembe
 - Mbikazi Akakulu Dube – Owner, Indaba Pub & Grill, Siavonga
 - Modrine Zulu – Owner, Look Landz LLC, Gwembe
 - Fanwell Muvulo – Owner, Muvulo Enterprises, Sinazongwe
 - Lackson Chipeleme – Owner, Chipeleme General Dealers, Siavonga
 - **TIER 3. Village Level** (Gwembe, Siavonga, and Sinazongwe Districts)
 - Betty Muleya – Community Health Volunteer, Sinazongwe (see web log posts, pg. 44) <https://agrilinks.org/post/community-health-worker-becomes-fishfirst-zambia-champion-and-local-catalyst-change>
 - Mike Chipanda – Community Health Volunteer, Siavonga
 - Marvis Nyangale – Community Health Volunteer, Gwembe

Abbreviations and Acronyms

AIs	Adequate Intakes
CHV	Community Health Volunteers
ComFA+Fish	Complementary Food for Africa+Dried Fish Powder
DRIs	Dietary Reference Intakes
EPA	U.S. Environmental Protection Agency
FDA	U.S. Food and Drug Administration
FGD	Focus Group Discussions
HHS-II	Household Hunger Scale II
IOM	Institute of Medicine, National Academies of Sciences, Engineering, and Medicine
IYC	Infants and Young Children
LMIC	Low- and Middle-Income Countries
MDD-IYC	Minimum Dietary Diversity-Infants & Young Child Module
MDD-WRA	Minimum Dietary Diversity-Women of Reproductive Age Questionnaire
NFNC	National Food and Nutrition Commission of Zambia
PHFL	Post-Harvest Fish Loss Assessment for Smallscale Fisheries
RCT	Randomized Controlled Trial
RDAs	Recommended Dietary Allowances
SSA	Sub-Saharan Africa
USAID	United States Agency for International Development
WEAI	Women's Empowerment in Agriculture Index
WEFI-FFZ	Women Empowerment in Fisheries Index for FishFirst! Zambia

Glossary

Dietary Reference Intakes (DRIs): DRI values include Recommended Dietary Allowances (RDAs) and Adequate Intakes (AIs). RDAs are the level of intake of essential nutrients determined by the Food and Nutrition Board of the National Academies' IOM to be adequate to meet known nutrient needs of practically all healthy persons. AIs are used when there is not enough data to calculate an average requirement; these are the average nutrient levels consumed daily by a typical healthy population assumed to be adequate for the population's needs.

Hidden Hunger: Chronic deficiencies in essential micronutrients due to diets of insufficient quality.

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Abstract

Undernutrition among infants and young children (IYC) is serious in Zambia, as 34.6% of children under age 5 years are stunted⁽¹⁾ and daily intakes of energy, calcium, iron, and vitamins are below recommendations.⁽²⁾ Risk of stunting increases during the complementary feeding stage, as vulnerable IYC begin consuming diets that rely heavily on cereal-based staples (e.g., maize), which lack essential protein, fats, and micronutrients.^(3,4) Enhancing vulnerable IYC's diets is achievable by adding nutrient-dense whole pelagic small fish—an affordable animal source food rich in protein, fatty acids, and micronutrients (e.g., iron, calcium, and zinc).⁽⁵⁻¹⁰⁾ Supported by USAID through the Feed the Future Innovation Lab for Fish, FishFirst! Zambia's goal is to harness the power of pelagic small fish to benefit nutrition among vulnerable IYC and their families. Our project's technology/innovation is Complementary Food for Africa+Dried Fish Powder (**ComFA+Fish**), a novel protein/micronutrient blend to fortify traditional foods whose key ingredient is Dried Fish Powder made from locally sourced pelagics (e.g., Kapenta, *Limnothrissa miodon* and *Stolothrissa tanganyicae*). As the necessary first steps towards **scaling ComFA+Fish** across Zambia and sub-Saharan Africa (SSA), we conducted trainings/activities including: 1) Sensory Panel I to evaluate acceptability of four ComFA+Fish dishes; 2) Sensory Panel II to evaluate IYC's acceptability of ComFA+Fish Complementary Maize Porridge; and 3) Sensory Panel III to evaluate acceptability of Plain and Vanilla ComFA+Fish Instant Porridges. Having determined high acceptability ComFA+Fish, our next steps are: 1) Complete a shelf-life study of Kapenta Dried Fish Powder (underway); 2) Adjust ComFA+Fish recipes as needed to ensure meeting recommended nutrient intakes without compromising flavor, etc.; 3) Continue to forge collaborations with in-country partners to scale ComFA+Fish at national/regional-, district- and village-levels across Zambia and SSA; and 4) Seek funding to conduct a randomized controlled trial to determine efficacy of ComFA+Fish or ComFA+Fish PLUS (a multicomponent intervention) on linear growth, cognitive development, and anemia among IYC followed over a 24-month period.

Introduction

In low- and middle-income countries (LMIC) across sub-Saharan Africa (SSA), including Zambia, an estimated 250 million children under five years of age are malnourished and at developmental risk due to extreme poverty. Malnourishment among

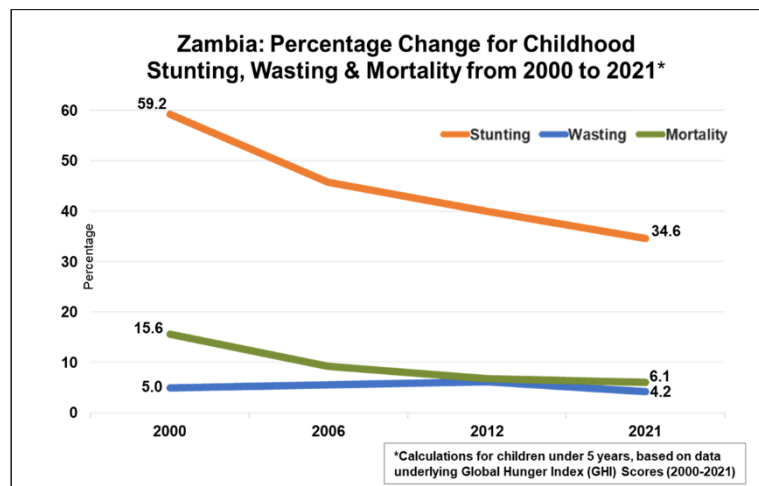


Figure 1. Percentage change for childhood stunting, wasting, and mortality in Zambia from 2000 to 2021. Source: Global Hunger Index.

infants and young children (IYC) can manifest as hidden hunger (chronic deficiencies in essential micro-nutrients due to diets of insufficient quality), stunting (low height-for-age), or wasting (as low weight-for-height).⁽¹¹⁻¹⁴⁾ Results from the 2022 Global Hunger Index⁽¹⁵⁾ indicate that Zambia has reduced the country's rate of childhood stunting by more than half in the past two decades (see Figure 1). And although the rate of wasting in Zambia hasn't seen much change during this period, Zambia has reduced the rate of child mortality by more than half in the past two decades.^(ibid.) Despite such progress, it is noteworthy that the Global Hunger Index ranks the seriousness of the hunger situation in Zambia as just above Afghanistan. Likewise, leading development organizations such as the United States Agency for International Development (USAID) and UNICEF report that poverty, food insecurity, and child malnutrition remain high in Zambia, and the country's rural poor are particularly vulnerable.^(1,16) According to USAID, the rates of stunting (which is associated with chronic or recurring malnutrition) and wasting (which is associated with acute malnutrition) stand at 34.6% and 4.2%, respectively, among Zambian children under five years of age.⁽¹⁾

Complementary feeding marks infants' transition from exclusive breastfeeding to eating solid foods. However, across SSA, this transition is associated with stunting and cognitive delays among IYC in vulnerable households whose diets rely heavily on maize. Widely consumed across Zambia

and SSA, complementary maize porridge is high in carbohydrates, but low in the vital protein and fats and the essential micronutrients and vitamins that IYC need. Although multiple micronutrient powders, which are internationally standardized prepackaged sachets of vitamins and minerals produced by a handful of global suppliers and distributed by donors such as UNICEF, have helped reduce global rates of stunting and anemia among vulnerable IYC, they have had less impact on protein malnutrition. Dried Fish Powder made from pelagic whole small fish is a protein- and nutrient-dense animal source food ready to be harnessed to reduce stunting and cognitive delays because—even when consumed in small quantities—Dried Fish Powder provides approximately 15 essential micronutrients, and vitamins A, C, B12, E and D.

Supported by USAID through the Feed the Future Innovation Lab for Fish, FishFirst! Zambia’s goal is to increase the quality and quantity of fish benefitting nutrition and food security in Zambia, particularly for IYC in the first 1,000 days of life (from conception until age 2 years) and pregnant and breastfeeding women. We focused on the use of Dried Fish Powder as the key ingredient of our novel protein/micronutrient blend, *Complementary Food for Africa+Dried Fish Powder (ComFA+Fish)*. We developed ComFA+Fish to harness the power of nutrient-dense Dried Fish Powder to impact nutritional deficiencies among IYC and pregnancy and birth outcomes among women. As our activities were concentrated at Lake Kariba, which is Zambia’s primary source of Kapenta (*Limnothrissa miodon* and *Stolothrissa tanganicae*), we focused on the use of Kapenta Dried Fish Powder as the key ingredient of ComFA+Fish.

Research Methods

FISHFIRST! ZAMBIA PHASE I (2020-2021)

In May 2021, we administered a battery of six (6) survey instruments to a random sample of 485 fishers, processors, and traders at Lake Kariba. **Collectively referred to as the WEFI-FFZ**, the

instruments were administered by 14 enumerators who completed a 2-day in-person Enumerator Training Workshop. All instruments were available in English, Tonga, and Nyanja. Details include:

- 1. Women Empowerment in Fisheries Index-FishFirst! Zambia (WEFI-FFZ)** is a novel tool previously adapted by WorldFish⁽¹⁷⁾ from the Women's Empowerment in Agriculture Index (WEAI),⁽¹⁸⁾ which we further adapted for FishFirst! Zambia.
- 2. Household Hunger Scale II (HHS-II)**, which we adapted from USAID's original Household Hunger Scale.⁽¹⁹⁻²¹⁾ Whereas the original scale combined individual- and household-level responses for 3 Hunger Events experienced in the past 4 weeks, our **HHS-II** separated individual- from household-level responses for 4 Hunger Events experienced in the past 4 weeks. The **NEW HHS-II Hunger Event 1** included 5 NEW questions: 1) How many meals (not including small snacks) do you usually eat in a typical day?; 2) In the past 4 weeks: Did you miss a regular meal due to lack of food or resources to get food?; 3) How often did this happen?; 4) In the past 4 weeks: Did any other household member(s) miss a regular meal due to lack of food or resources to get food in the past 4 weeks?; 5) How often did this happen? **HHS-II Hunger Event 2** included the original 2 questions: 1) In the past 4 weeks: Was there ever no food to eat in your dwelling due to lack of resources to get food?; 2) How often did this happen? **HHS-II Hunger Event 3** included 2 NEW questions: 1) In the past 4 weeks: Did you go to sleep at night hungry because there was not enough food?; 2) How often did this happen? **HHS-II Hunger Event 4** included 2 NEW questions: 1) In the past 4 weeks: Did you go a whole day and night without eating anything at all because there was not enough food?; 2) How often did this happen?
- 3. Post-Harvest Fish Loss Assessment for Smallscale Fisheries (PHFL)**, which we created to collect data among three sectors of value chain actors: fishers, processors, and traders.

4. **Minimum Dietary Diversity-Women of Reproductive Age Questionnaire (MDD-WRA)** was administered to women ages 18-49 years with children ages 6-23 months.
5. **Minimum Dietary Diversity-Infants & Young Child Module (MDD-IYC)** was administered to the MDD-WRA respondents to collect data on their 6-23 month-olds.
6. **Anthropometric Data:** Weight and height were collected for respondents' 6-23 month-olds.

FISHFIRST! ZAMBIA PHASE II (2021-2022)

In 2022, we conducted six activities, all of which were in English and Tonga. Details include:

1. **Nutrition Training (N=66):** Components of this 3-hour interactive training included: 1) Nutrition concepts and importance of nutrition in the First 1,000 Days of Life; 2) Serving sizes for infants; 3) Kapenta and Dried Fish Powder: Nutritional Benefits; 4) Home-production and use of Kapenta Dried Fish Powder; 5) Water, Sanitation Hygiene (WASH); 6) UNICEF video, “What to Feed Your Young Child,” which we translated into Tonga: <http://sendanywhe.re/90I5KALP>.
2. **ComFA+Fish Cooking Demo/Kapenta Nutrition Training (N=66):** We conducted one cooking demo/nutrition training that: 1) showcased four ComFA+Fish dishes (see below); 2) focused on Kapenta Dried Fish Powder's benefits; and 3) featured using Dried Fish Powder and other local ingredients (e.g., groundnut powder) to make the four ComFA+Fish dishes. These dishes included: **1) ComFA+Fish Complementary Maize Porridge; 2) ComFA+Fish Chibwabwa Fisashi; 3) ComFA+Fish Kapenta Chutney; and 4) ComFA+Fish Bean-Vegetable Soup.** This cooking demo/nutrition training focused on dishes suitable for household consumption. Participants were recruited from the Districts of Gwembe, Siavonga, and Sinazongwe and included the following three groups: 1) Mothers/Community Health Volunteers (CHV); 2) Entrepreneurs/Businesses; and 3) Government Officials (e.g., District-Level Ministry of Health personnel, Department of Fisheries personnel, and political leaders and staff).

- 3. ComFA+Fish Micro-Enterprise/Entrepreneur Training (N=77):** The Training: 1) promoted microenterprises/income-generation through producing/selling ComFA+Fish-fortified foods; 2) showcased **ComFA+Fish Cassava Bites and ComFA+Fish Nutri-Biscuits** for producing/selling at local markets and for household consumption; 3) focused on Kapenta Dried Fish Powder's benefits; and 3) featured using Dried Fish Powder and other local ingredients (e.g., cassava flour) to make the dishes. Participants include individuals who had participated in ComFA+Fish Cooking Demo/Kapenta Nutrition Training, including: 1) Mothers/CHV; 2) Entrepreneurs/Businesses; and 3) Government Officials.
- 4. ComFA+Fish Sensory Panel I (N=42):** Women ages 18-49 years who were mothers of 6-23 month-olds evaluated the acceptability of four ComFA+Fish dishes for household consumption: **1) ComFA+Fish Complementary Maize Porridge; 2) ComFA+Fish Chibwabwa Fisashi; 3) ComFA+Fish Kapenta Chutney; and 4) ComFA+Fish Bean-Vegetable Soup.** Women were recruited from the Districts of Gwembe ($n=14$), Siavonga ($n=14$), and Sinazongwe ($n=14$). Mothers' eligibility requirements for Sensory Panel I included that their IYC: 1) had no known allergy to Dried Fish Powder, groundnut powder, orange-fleshed sweet potato, peanut/nut oil, or vegetable oil; 2) had consumed fish and/or fish-based foods prior to recruitment; and 3) had consumed complementary maize porridge prior to recruitment. We developed a technical lexicon that mothers used to evaluate five sensory and two non-sensory attributes of the ComFA+Fish dishes (i.e., aroma, appearance, texture, flavor, sweetness, convenience, overall acceptability). Development of the lexicon and panel procedures were informed by Madrelle et al. (2017) and others.⁽²²⁻²⁴⁾ For each dish, mothers used an evaluation form to score the dish's seven attributes using a 5-point scale where 1=extremely disliked and 5=extremely liked. The evaluation form included "smiley face" emojis that correlated with each point of the 5-point scale (see Appendix

1) and mothers marked the appropriate emoji with an “X.” The dishes were prepared onsite at separate cooking stations and served immediately.

- 5. ComFA+Fish Sensory Panel II (N=84):** The same group of mothers ($n=42$) evaluated whether their IYC ($n=42$) found **ComFA+Fish Complementary Maize Porridge** acceptable. Development of the descriptors and panel’s procedures were informed by Madrelle et al. (2017) and others.⁽²²⁻²⁴⁾ The porridge was prepared onsite and served immediately to mothers, who fed the porridge to their IYC during three consecutive tasting intervals (Times 1-3). The serving size was 50g (~8oz.) and IYC were fed their portion using identical infant spoons and 8oz. clear plastic cups. We created three items for mothers to assess their child’s global liking of the porridge (see Appendix 2). Item 1 used the same emojis and scale as in Sensory Panel I, where 1=child extremely disliked and 5=child extremely liked. For example, if the IYC spit out the food, pushed the food away, etc., mothers indicated that the IYC extremely disliked the porridge. For item 2, we created “bowl/portion” icons and mothers selected the icon that best correlated with the *actual* amount of porridge their IYC consumed during the entire meal (sum of Times 1-3). For item 3, we used the same bowl/portion icons and mothers selected the icon that best correlated with the *relative* amount of porridge the IYC consumed during the entire meal (sum of Times 1-3), as compared to the child’s regular intake of food during a meal served to IYC at that time of day.
- 6. Kapenta Dried Fish Powder—Sampling and Nutrient Analysis:** Following a 4-step sampling protocol, we collected four samples of whole dried Kapenta sourced from Lake Kariba from four separate smallscale vendors at open markets in Lusaka. Each sample weighed a minimum of 0.5 kg and was inspected for wholesomeness (i.e., no degradation associated with spoilage). Emulating the traditional process used in Zambian home kitchens, each sample was dry roasted in a large pan and the four samples were then combined into one 2-kg sample. This sample was taken to a

smallscale miller at an open market, ground into Kapenta Dried Fish Powder, shipped to the U.S., and distributed to two accredited commercial labs for nutrient analysis: 1) Mérieux NutriSciences; and 2) Mississippi State Chemical Laboratory.

FISHFIRST! ZAMBIA PHASE III (2022-2023)

In June 2023, we conducted the FishFirst! Zambia: Phase III Learning Event & Workshop. See Appendix 1 for Sensory Panel III's evaluation form. The program's details include:

1. **Learning Event 1.** *ComFA+Fish Sensory Panels I-II Results.*
2. **Learning Event 2.** *FishFirst! Zambia Video: 2022 Nutrition Training Highlights.*
3. **Learning Event 3.** *Household Hunger Scale II Results: Lake Kariba Fisher Families and Food Insecurity.*
4. **Learning Event 4.** *Scaling Readiness Assessment for ComFA+Fish Instant Porridges.*
5. **Keynote Speech & Launch:** *DRAFT ComFA+Fish Recipe Booklets* (English, Tonga versions).
6. **Sensory Panel III - Part 1: Plain ComFA+Fish Instant Porridge (N=40).**
7. **Sensory Panel III - Part 2: Vanilla ComFA+Fish Instant Porridge (N=38).**
8. **ComFA+Fish Focus Group Discussions: *Perceptions of Dried Fish Powder for Child & Household Nutrition.*** Participants included three groups: 1) Mothers/CHV; 2) Entrepreneurs/Businesses; 3) Government Officials.
9. **ComFA+Fish Scaling Readiness Exercise.** For this exercise, the participants were divided into two groups: 1) Mothers/CHV; and 2) Entrepreneurs/Businesses + Government Officials.

Research Results

FISHFIRST! ZAMBIA PHASE I RESULTS (2020-2021)

- **RESULTS:** The Women's Empowerment in Fisheries Index-FishFirst! Zambia (**WEFI-FFZ**), Post-Harvest Fish Loss Assessment for Smallscale Fisheries (**PHFLA**), Household Hunger Scale

II (**HHS-II**) were administered to 485 respondents of whom 61.6% were women ($n=185$ men, $n=299$ women), 96.1% were ages 18-49 years ($n=466$), 93.2% were married ($n=452$), 100% self-identified as a key household decision-maker, and 23.1% reported 0-7 years of education ($n=112$). Women of reproductive age (18-49 years) were over-sampled, as they were also administered the Minimum Dietary Diversity-Women of Reproductive Age Questionnaire (**MDD-WRA**) and Minimum Dietary Diversity-Infants & Young Child Module (**MDD-IYC**), and anthropometric data was collected for their 6-23 month-olds. Women of reproductive age (18-49 years) were over-sampled, as they were also administered the Minimum Dietary Diversity-Women of Reproductive Age Questionnaire (**MDD-WRA**) and Minimum Dietary Diversity-Infants & Young Child Module (**MDD-IYC**), and anthropometric data was collected for their 6-23 month-olds.

- HHS-II Hunger Event 1:** 52% of respondents and 44.2% of households experienced Hunger Event 1 at the occasional-, moderate-, or severe-level hunger in the past four weeks. **Hunger Event 2:** 36.8% of households experienced Hunger Event 2 at the occasional-, moderate-, or severe-level

HUNGER EVENT 1:			HUNGER EVENT 2:		
Past 4 weeks: How often did [YOU][OTHER] miss a regular meal due to lack of food or resources to get food? (N=484)			Past 4 weeks: How often was there no food to eat in your dwelling due to lack of resources to get food? (N=484)		
	SELF % (n)	OTHER % (n)		% (n)	
No hunger (0x)	47.9 (232)	55.8 (270)	No hunger (0x)	63.2 (306)	
Occasional hunger (1-2x)	24.8 (120)	23.1 (112)	Occasional hunger (1-2x)	22.1 (107)	
Moderate hunger (3-10x)	23.1 (112)	17.6 (85)	Moderate hunger (3-10x)	12.8 (62)	
Severe hunger (≥11x)	4.1 (20)	3.5 (17)	Severe hunger (≥11x)	1.9 (9)	
HUNGER EVENT 3:			HUNGER EVENT 4:		
Past 4 weeks: How often did [YOU][OTHER] go to sleep at night hungry because there was not enough food? (N=484)			Past 4 weeks: How often did [YOU][OTHER] go a whole day and night without eating because there was not enough food? (N=484)		
	SELF % (n)	OTHER % (n)		SELF % (n)	OTHER % (n)
No hunger (0x)	65.1 (315)	68.6 (332)	No hunger (0x)	87.4 (423)	88.6 (429)
Occasional hunger (1-2x)	21.7 (105)	21.1 (102)	Occasional hunger (1-2x)	7.9 (38)	6.6 (32)
Moderate hunger (3-10x)	12.2 (59)	9.3 (45)	Moderate hunger (3-10x)	3.9 (19)	4.1 (20)
Severe hunger (≥11x)	1.0 (5)	1.0 (5)	Severe hunger (≥11x)	0.8 (4)	0.6 (3)

Figure 2. Results from the Household Hunger Scale II (HHS-II) for four Hunger Events.

hunger in the past four weeks. **Hunger Event 3:** 34.9% of respondents and 31.5% of households experienced Hunger Event 3 at the occasional-, moderate-, or severe-level hunger in the past four weeks. **Hunger Event 4:** 12.6% of respondents and 11.3% of households experienced Hunger Event 4 at the occasional-, moderate-, or severe-level hunger in the past four weeks.

▪ **PEER-REVIEWED PUBLICATION:**

- Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., Torell, E. & Kolbila, R. (2022). Adapting the WEAI to explore gender equity among fishers, processors, and sellers/traders at Zambia's Lake Bangweulu. *World Development*, 152, 105821.
<https://doi.org/10.1016/j.worlddev.2022.105821>

▪ **MANUSCRIPTS UNDER REVIEW:**

- Oaks, B.M., Gyimah, E.A., Kleban, E., Ragsdale, K., & Iannotti, L.L. (Submitted June 24, 2023). Mollusk and crustacean consumption in the first 1,000 days: a systematic review. *Nutrition Research Reviews*.
- Ragsdale, K., Read-Wahidi, M.R., Mudege, N.M., Iannotti, L., Muzungaire, L., & Funduluka, P. (Revised/Resubmitted July 6, 2023). Sensory panel results of a Dried Fish Powder supplement among caregivers and young children in Zambia. *Public Health Nutrition*.

▪ **MANUSCRIPTS IN DEVELOPMENT:**

- Ragsdale, K., Read-Wahidi, M. R., Mudege, N., & Iannotti, L. (In Development). Adapting the Household Hunger Scale II (HHS-II) to measure individual- and household-level food security among fisher families at Lake Kariba. *Food Security*.
- Ragsdale, K., Torell, E., Read-Wahidi, M. R., & Mudege, N. (In Development). Piloting the novel Post-Harvest Fish Loss Assessment (PHFLA) for smallscale fisheries at Lake Kariba. *World Development Perspectives*.

- Ragsdale, K., Read-Wahidi, M. R., Mudege, N., Iannotti, L., & Marinda, P. (In Development). Exploring dietary diversity among mothers and their children at Lake Kariba, Zambia. *Food and Nutrition Bulletin*.

FISHFIRST! ZAMBIA PHASE II RESULTS (2021-2022)

- **ComFA+Fish Sensory Panel I Results (N=42 adults).** **Sensory Attributes:** Caregivers evaluated five sensory attributes (i.e., aroma, texture, flavor, appearance, sweetness) of the four ComFA+Fish dishes. The sensory scores for three ComFA+Fish dishes indicate **high acceptability**, as averaged scores for “extremely liked/liked” ranged from 95% (ComFA+Fish Chibwabwa Fisashi) to 82% (ComFA+Fish Kapenta Chutney). While 67% of caregivers extremely liked/liked the sensory attributes of the ComFA+ Fish Bean-Vegetable Soup, its appearance was less desirable, which suggests that the soup recipe should be adjusted to improve appearance, given the importance of a food’s visual appeal in determining food preferences. The results are promising, as a fish-based protein/micronutrient blend like ComFA+Fish can add an unusual flavor to a dish. **Non-Sensory Attributes:** The results suggest **high acceptability** among caregivers of the attributes of convenience and overall acceptability for all four ComFA+Fish dishes. Given that the extreme time poverty of resource-limited women across SSA is well documented,⁽²⁸⁻³⁰⁾ convenience is key to scaling a protein/micronutrient blend like ComFA+Fish and ensuring that resource-limited women 1) adopt the product long-term and 2) use it regularly (i.e., in at least one meal per day for their 6-23 month-olds). A nutrient-dense supplement that does not account for the time poverty of women caregivers (i.e., does not ensure that a new technology/innovation like ComFA+Fish is easy to use on a daily basis) will likely encounter barriers to wide-spread adoption despite its efficacy. Therefore, we designed the ComFA+Fish dishes with convenience as a central attribute. By using Dried Fish Powder as its primary

ingredient, ComFA+Fish is a nutrient-dense, locally accessible product that can easily be added to dishes that family members—including IYC—are already consuming. This ensured that the ComFA+Fish dishes also received **high scores for overall acceptability**, as this is an attribute that consumers can find more important than individual sensory attributes.

- **ComFA+Fish Sensory Panel II Results (N=84):** ComFA+Fish complementary maize porridge was evaluated among a majority of caregivers ($n=42$) as **highly acceptable** to their 6-23 month-olds ($n=42$). This is promising given that maize porridge is one of the most common complementary foods for IYC across Zambia and SSA. **In terms of scalability**, a critical concern was that a fish-based protein/micronutrient blend like ComFA+Fish might not be appetizing to IYC when added to maize porridge. We found that fortifying complementary maize porridge with ComFA+Fish did not negatively impact children's food intake. This is **extremely promising** for meeting the protein/micronutrient needs of vulnerable IYC, as their gastric capacities can only accommodate small meals and, therefore, every meal should be nutrient-dense.
- **Kapenta Dried Fish Powder—Nutrient Analysis Results:** As seen in Table 1 (below), ages were categorized into three groups according to Dietary Reference Intakes (DRIs), which include infants ages 7-12 months, children ages 1-3 years, and women ages 19-50 years. Recommended DRI values for infants, children, and women were obtained from the National Academies' Institute of Medicine.^(25,26) Recommendations on allowable mercury concentrations in fish were obtained from the U.S. Food and Drug Administration (FDA) and U.S. Environmental Protection Agency (EPA).⁽²⁷⁾ The sample's mercury concentration was 0.14 ug/100g, which is below the FDA/EPA highest allowable average mercury concentration in fish per serving of 15ug/100g, when consuming three servings of fish per week. The amount of Kapenta Dried Fish Powder in each ComFA+Fish dish varied. The ComFA+Fish Chibwabwa Fisashi recipe used 64g of Dried Fish

Powder, both the ComFA+Fish Complementary Maize Porridge and ComFA+Fish Bean-Vegetable Soup recipes used 128g of Dried Fish Powder, and the ComFA+Fish Kapenta Chutney recipe used 256g of whole dried fish. Recommended serving sizes for the ComFA+Fish dishes were 8-10g for 6-11 month-olds, 16-20g for 12-23 month-olds, and 32-40g for ≥ 24 month-olds,.

- For Table 1, we calculated the percentage of DRIs met for various nutrients, minerals, and vitamins based on serving sizes of 10g for infants, 20g for children ages 1-3 years, and 30g for women ages 19-50 years. The sample contained **high percentages** of the DRIs for protein, calcium, and zinc across all age categories and **extremely high percentages** of the DRI for vitamin B12 across all

Table 1. Dietary Reference Intakes (DRIs) and percentages of DRIs met for infants, children, and women per serving of Kapenta Dried Fish Powder.

Nutrients	Kapenta Dried Fish Powder (100 g prepared)	Infants 7-12 months		Children 1-3 years		Women 19-50 years	
		DRI value	% DRI met (10 g prepared)	DRI value	% DRI met (20 g prepared)	DRI value	% DRI met (30 g prepared)
Energy (kcal)	284.6	Variable		Variable		Variable	
Protein (g)	71.16	11	65%	13	109%	46	46%
Total Fat (g)	13.33	30*	4%	–	–	–	–
Omega 3 Fatty Acids							
DHA (g)	9.19	–	–	–	–	–	–
DPA (g)	1.037	–	–	–	–	–	–
EPA (g)	5.13	–	–	–	–	–	–
Choline (mg)	365	150*	24%	200*	37%	425*	26%
Minerals							
Calcium (mg)	2860	260*	110%	700	82%	1000	86%
Iodine (μg)	16	130*	1%	90	4%	150	3%
Iron (mg)	10.6	11	10%	7	30%	18	18%
Magnesium (mg)	158	75*	21%	80	40%	320	15%
Potassium (mg)	1390	860*	16%	2000*	14%	2600*	16%
Selenium (mg)	0.12	20*	–	20	–	55	–
Sodium (mg)	309	370*	8%	800*	8%	1500*	6%
Zinc (mg)	12.8	3	43%	3	85%	8	48%
Vitamins							
Vitamin A (μg)	1260	500*	25%	300	84%	700	54%
Vitamin B12 (μg)	11	0.5*	220%	0.9	244%	2.4	138%
Vitamin D (μg)	42.6	10*	43%	15	57%	15	85%
Alpha tocopherol (μg)	1.3	5*	3%	6	4%	15	3%

Note: This table presents Recommended Dietary Allowances (RDAs) in bold typeface and Adequate Intakes (AIs) in regular typeface followed by an asterisk (*).

age categories. The sample also contained **appreciable percentages** of the DRIs for choline, magnesium, vitamin A, and vitamin D across all age categories and the DRI for **iron** for children and women. For example, in terms of **protein**, 10g of the sample contained 65% of the DRI for infants, 20g contained 109% for children, and 30g contained 46% for women. A manuscript based on these results has been revised/resubmitted to the peer-reviewed journal, *Public Health Nutrition*. Details include:

- Ragsdale, K., Read-Wahidi, M. R., Mudege, N. M., Iannotti, L., Muzungaire, L., & Funduluka, P. (Revised/Resubmitted). Sensory panel results of a Dried Fish Powder supplement among caregivers and young children in Zambia. *Public Health Nutrition*.

FISHFIRST! ZAMBIA PHASE III RESULTS (2022-2023)

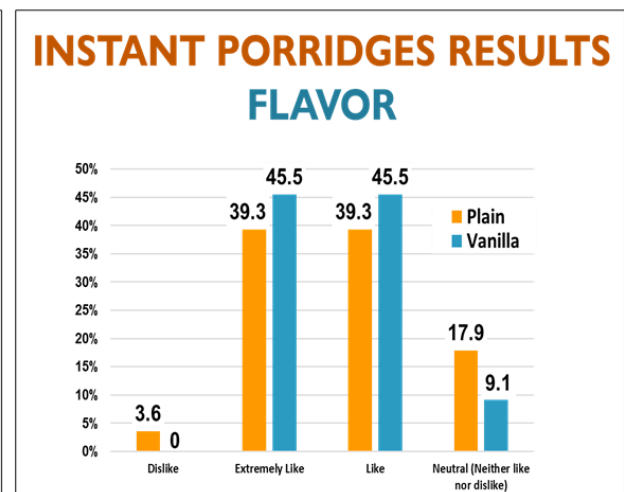
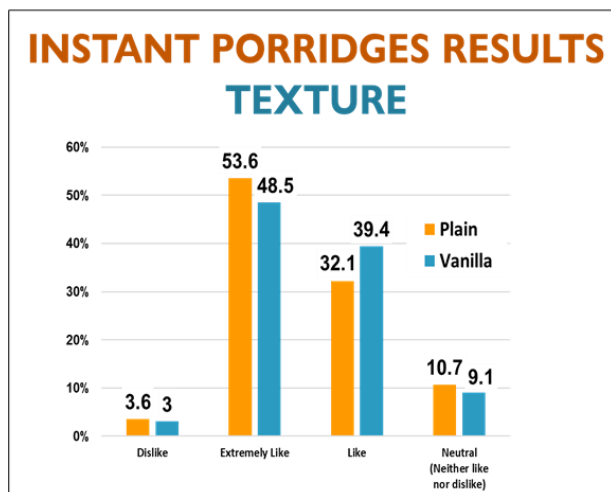
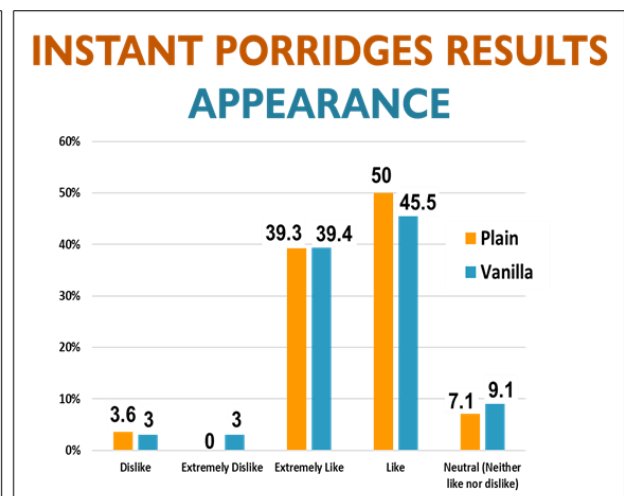
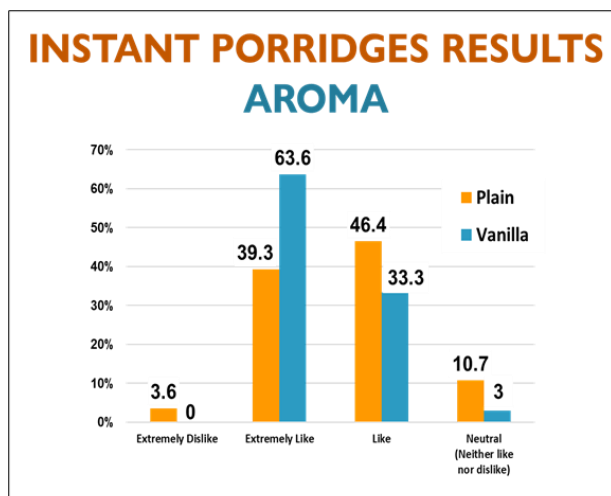
- **ComFA+Fish Sensory Panel III Results:** In June 2023, the FishFirst! Zambia team collaborated with **Sylva Food Solutions**—a multisectoral Zambian enterprise that mass-produces, brands, markets, and exports prepackaged foods for African and European markets—to provide Dried Fish Powder and other locally sourced key ingredients, which they then used to produce two ComFA+Fish Instant Porridges for Sensory Panel III. These sensory panels were incorporated into the FishFirst! Zambia: Phase III Learning Event and Workshop held in Siavonga on June 6-7, 2023. The team engaged government officials, entrepreneurs, NGOs, Ministry of Health



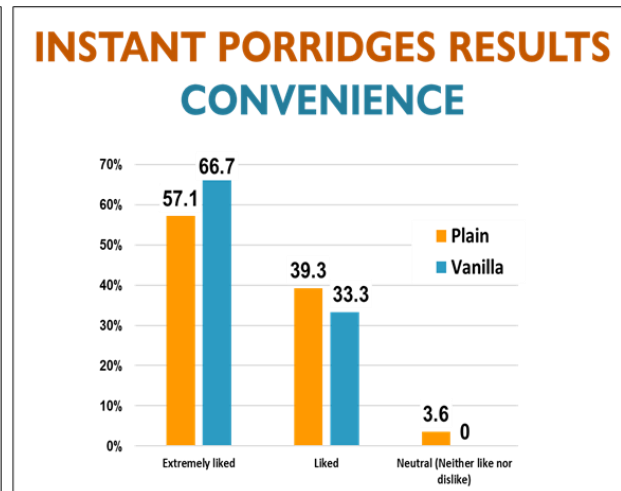
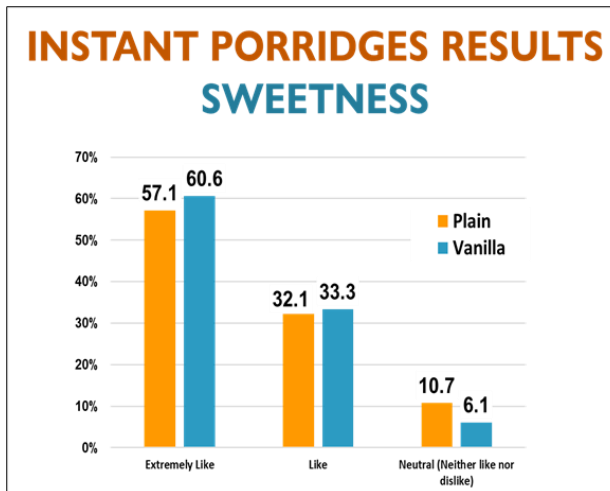
Lizzy Muzungaire displays the Plain and Vanilla ComFA+Fish Instant Porridges produced by Sylva Food Solutions in collaboration with Fish First! Zambia for Sensory Panel III. *Photo: A. Chileya, WorldFish Zambia*

staff, Department of Fisheries staff, community health volunteer workers, and mothers from the Districts of Gwembe, Siavonga, and Sinazongwe, the majority of whom had participated in FishFirst! Zambia Phase II in June 2022.

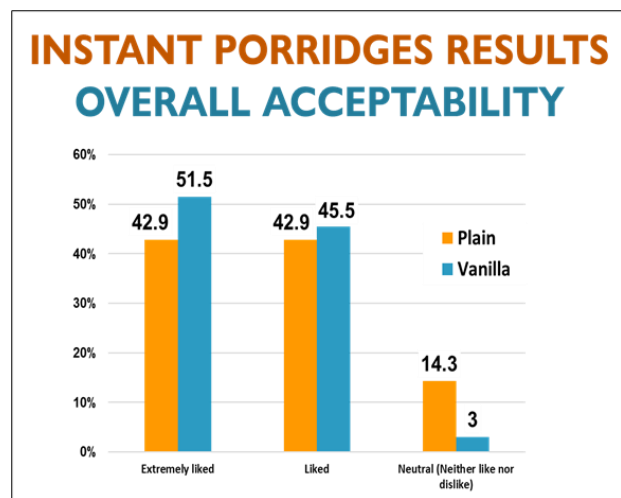
- The graphs below present the results side-by-side for the Plain ComFA+Fish Instant Porridge (N=40) and Vanilla ComFA+Fish Instant Porridge (N=38) using the same seven attributes from Sensory Panel I. Between 85–100% of respondents extremely liked or liked the aroma, appearance, texture, flavor, sweetness, convenience, and overall acceptability of the Vanilla ComFA+Fish Instant Porridge. Responses were similarly positive for all attributes of the Plain ComFA+Fish



Instant Porridge with the exception of flavor, which 79% of respondents extremely liked or liked (as compared to 91% for the flavor of the Vanilla ComFA+Fish Instant Porridge).



- The overwhelmingly positive evaluations of both the Plain ComFA+Fish Instant Porridge and Vanilla ComFA+Fish Instant Porridge are further evidence that ComFA+Fish is strategically well-placed to address protein and micronutrient gaps among IYC and other family members across Zambia and SSA.



- Addressing persistent protein and micronutrient gaps among vulnerable 6-23 month-olds is particularly important for low-resource households that lack dietary diversity and rely on high-phytate maize-based diets, which increases vulnerability to nutrient deficiencies, particularly for IYC during the complementary feeding stage. That both the Plain ComFA+Fish Instant Porridge and Vanilla ComFA+Fish Instant Porridge received high scores for convenience and overall acceptability suggests that these porridges have the potential for adoption at-scale in Zambia and across SSA. Testing two flavors of ComFA+Fish instant porridge was important, as some consumers—particularly IYC—may prefer one flavor over another.

- **ComFA+Fish Focus Group Discussion (FGD) Results Summaries: *Perceptions of Dried Fish Powder for Child & Household Nutrition***. Conducted in June 2023, a summary of FGD results for each group of participants is presented.
- **FGD Summary 1: Mothers/Community Health Volunteers (CHV) (N=8)**. Child nutrition practice is highly gendered, and mothers/CHV play an important role in promoting nutrition at the household level. All these Mothers//CHV had participated in the **2022 ComFA+Fish Cooking Demo/Kapenta Nutrition Training**, and reported that the program increased their knowledge of the nutritional benefits of local foods in their community, particularly Kapenta dried fish powder, groundnut, and dark green leafy vegetables (e.g., pumpkin leaves). They emphasized the need for community-level initiatives that underscore consuming fish combined with other locally available foods to increase IYC nutrition. All participants reported consistently using three of the four ComFA+Fish recipes as complementary foods for their IYC, which indicates the potential for successful adoption and scaling. These recipes included: **1) ComFA+Fish Complementary Maize Porridge; 2) ComFA+Fish Chibwabwa Fisashi; and 3) ComFA+Fish Kapenta Chutney**. This consistent use of these ComFA+Fish recipes suggests a level of trust in the quality and effectiveness of ComFA+Fish in providing essential nutrients for IYC's growth and development.
- **FGD Summary 2: Entrepreneurs/Businesses (N=5)**. A majority of this group of participants had participated in the **2022 ComFA+Fish Cooking Demo/Kapenta Nutrition Training**. This group of participants are keenly aware that local entrepreneurs/businesses can play a vital role in promoting and strengthening sustainable nutrition interventions in hard-to-reach areas and among vulnerable populations. Overall, participating entrepreneurs/businesses reported an optimistic outlook towards the scaling of ComFA+Fish. These participants highlighted several factors that

make ComFA+Fish an appealing investment: 1) As a new product in the local market, ComFA+Fish presents an opportunity for entrepreneurs/businesses to establish their presence and gain a competitive advantage; 2) ComFA+Fish has a wide target market – including adults, women, and children – which can serve to expand their customer base and market reach; 3) The high nutritional value of ComFA+Fish makes it attractive to consumers seeking nutritional food options, offering a compelling selling point for entrepreneurs/businesses.

- **FGD Summary 3: Government Officials (N=12).** A majority of these participants attended the **2022 ComFA+Fish Cooking Demo/Kapenta Nutrition Training**. These participants are keenly aware that their organizations are key partners in bringing sustainable health and wellbeing changes to rural and impoverished communities. They emphasized a number of nutritional barriers that they regularly encounter, including: 1) Inconsistent supply of therapeutic foods for treating malnutrition in IYC; 2) Delays in referrals for timely malnutrition treatment for IYC; 3) A deficit in local fish production; and 4) A lack of regular household consumption of fish. Participants reported that ComFA+Fish should easily garner support from governmental agencies because of its appealing characteristics, including: 1) ComFA+Fish has cost-effectiveness, as it is an affordable yet high-quality animal source protein; 2) Ease of integration of ComFA+Fish into traditional Zambian dishes (e.g., complementary maize porridge, chibwabwa fisashi); and 3) High acceptability of Dried Fish Powder—the key ingredient of ComFA+Fish—already exists within local communities. Thinking long term, Government Officials highlighted existing government infrastructures and resources that can be leveraged to support the promotion and scaling of ComFA+Fish. This includes: 1) Utilizing the existing Community Health Volunteers (CHV) networks to educate/raise awareness of the nutritional benefits of ComFA+Fish; 2) Incorporating ComFA+Fish into government initiatives such as the Outpatient Community

Referral Initiative; and 3) Integrating information about ComFA+Fish into routine “growth monitoring sessions” at Growth Promotion Centers and other health facilities. This positive feedback from these participants collectively highlights a potential for buy-in from key governmental agencies of ComFA+Fish to address nutritional needs of vulnerable IYC.

- **ComFA+Fish Scaling Readiness Exercise Results:** Conducted in June 2023, the data from the Scaling Readiness Exercise is currently under analysis.

Outputs and Conclusions

- FishFirst! Zambia was the necessary first step to ground-proof scalability of ComFA+Fish to address IYC’s protein and micronutrient deficiencies and improve birth outcomes in Zambia and across SSA. Having determined high acceptability ComFA+Fish, our next steps are: 1) Complete a shelf-life study of Kapenta Dried Fish Powder (underway); 2) Adjust the recipes as needed to ensure recommended serving sizes meet recommended intakes without compromising flavor, etc.; 3) Continue to forge collaborations with three tiers of in-country partners to scale ComFA+Fish at the national/regional level (e.g., to school feeding programs across Zambia and SSA), district level, and village level across Zambia and SSA; and 4) Seek funding to conduct a randomized controlled trial among Zambian infants 6-8 months old followed over 24 months. Details include:
 - **TIER 1 IN-COUNTRY PARTNERS.** Ministry of Health; Ministry of Fisheries and Livestock; **Muntanga Mapani MD** (Executive Director, National Food and Nutrition Commission of Zambia (NFNC); **Dr. Chisela Kaliwile** (Principal Nutritionist, NFNC); and **Sylvia Banda (CEO, Sylva Food Solutions)**. For example, during FishFirst! Zambia Phase III, we collaborated with Banda and Sylva Food Solutions to produce and evaluate the acceptability of Plain ComFA+Fish Instant Porridge ($N=40$) and Vanilla ComFA+Fish Instant Porridges ($N=38$) (see Appendix 4 for results).

- **TIER 2. IN-COUNTRY PARTNERS.** Government personnel and entrepreneurs/businesses in Gwembe, Siavonga, and Sinazongwe Districts, including Geoffrey Jakopo (Siavonga District Commissioner); Adidja Sumbwe MD (Siavonga District Health Director), Twaambo Mandeva (Gwembe District Nurse); Mbikazi Akakulu Dube (Indaba Pub & Grill, Siavonga); Modrine Zulu (Look Landz LLC, Gwembe); Fanwell Muvulo (Muvulo Enterprises, Sinazongwe); and Lackson Chipeleme (Chipeleme General Dealers, Siavonga).
- **TIER 3. IN-COUNTRY PARTNERS.** Community Health Volunteers (CHV) in Gwembe, Siavonga, and Sinazongwe Districts including Betty Muleya (<https://tinyurl.com/3a42yf8e>); Mike Chipanda; and Marvis Nyangale.
- **PROPOSED RANDOMIZED CONTROLLED TRIAL (RCT): Aim I.** Determine effects of receiving ComFA+Fish or ComFA+Fish PLUS (a multicomponent intervention) on linear growth, cognitive development, and anemia among Zambian infants 6-8 months followed over 12 months. **Aim II.** Determine effects of receiving ComFA+Fish or ComFA+Fish PLUS on linear growth, cognitive development, and anemia among infants 6-8 months followed over 24 months. Outcomes are expected to contribute to the growing body of evidence that consuming locally sourced Dried Fish Powder and other aquatic animal source foods are promising as ways to reduce stunting and other nutrition-sensitive health outcomes in Zambia and across SSA.⁽³¹⁾ See Appendix 3 for a list of products related to Outputs/Dissemination.

Technologies/Innovations

- 2019 Ragsdale, K., Read-Wahidi, M.R., Pincus, L., Marinda, P., & Torell, E. (2019). *Women's Empowerment in Fisheries Index-FishFirst! Zambia (WEFI-FFZ)*, adapted from the Women's Empowerment in Agriculture Index (WEAI) and WorldFish WEFI.
- 2021 Ragsdale, K., Read-Wahidi, M. R., Torell, E., Mudege, N., & Marinda, P. (2021). *Post-Harvest Fish Loss Assessment for Smallscale Fisheries (PHFLA): An Open-Access Customizable Tool*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 9 pp.
https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/inline-files/Ragsdale%20et%20al_PHFLA_Survey%20Tool_FINAL_2.pdf

- 2021 Ragsdale, K., Read-Wahidi, M. R., Mudege, N., & Marinda, P. (2021). *Household Hunger Scale II (HHS-II)*, adapted from Ballard et al. (2011).
- 2022 Ragsdale, K., Read-Wahidi M. R., & Mudege, N. (2022). *Complementary Food for Africa+Dried Fish Powder (ComFA+Fish)*. This is a protein/micronutrient blend whose key ingredient is Dried Fish Powder, whose other ingredients include locally available nutrient-dense powder (e.g., groundnut power, soybean flour, dried pumpkin leaves), and which is used to fortify IYC's complementary maize porridge and other traditional foods.
- 2022 Ragsdale, K., Read-Wahidi M. R., Mudege, N., Muzungaire, L., & Iannotti, L. (2022). *FishFirst! Zambia: Sensory Panel I Protocol, Consent Form, Scale I-Facilitator Script, Scale I-Technical Lexicon & Simplified Lexicon, and Scale I-Evaluation Form* for: 1) ComFA+Fish Complementary Maize Porridge; 2) ComFA+Fish Chibwabwa Fisashi; 3) ComFA+Fish Kapenta Chutney; and 4) ComFA+Fish Bean-Vegetable Soup.
- 2022 Ragsdale, K., Read-Wahidi M. R., Mudege, N., Muzungaire, L., & Iannotti, L. (2022). *FishFirst! Zambia: Sensory Panel II Protocol, Parental Assent Form, Scale II-Facilitator Script, Scale II-IYC Descriptors, Scale II-Evaluation Form: ComFA+Fish Complementary Maize Porridge*.
- 2022 Muzungaire, L., Mudege, N., Ragsdale, K., & Read-Wahidi, M. R. (2022). *Multi-Stakeholder Analysis: Staple Foods Seasonality & Utilization in Lake Kariba Region*.
- 2022 Ragsdale, K., Read-Wahidi, M. R., Mudege, N., & Iannotti, L. (2022). *FishFirst! Zambia: Kapenta Dried Fish Powder Sample Collection – Procedures*.
- 2022 Ragsdale, K., Read-Wahidi, Mudege, N., & Iannotti, L. (2022). *FishFirst! Zambia: Kapenta Dried Fish Powder Nutrient Analysis – Protocol*.
- 2023 Ragsdale, K., Read-Wahidi, Mudege, N., & Muzungaire, L. (2023). *FishFirst! Zambia: Focus Group Discussions for Scaling ComFA+Fish*.
- 2023 Mudege, N., Muzungaire, L., Kakwasha, K., Ragsdale, K., & Read-Wahidi, M. R. (2023). *Scaling Readiness Exercise. FishFirst! Zambia: ComFA+Fish Scaling Readiness Exercise*.

Key Beneficiaries

- **Vulnerable Infants and Young children**, particularly those in the first 1,000 days of life.
- **Caregivers of vulnerable IYC**.
- **Vulnerable Women of Reproductive Age**, particularly who are pregnant or breastfeeding.
- **Vulnerable Adolescents and Other Households Members**, particularly adolescent girls.
- **Community Health Volunteers**, who are the first line of healthcare for IYC, caregivers of IYC, WRA, and other family members in food insecure households.

References

1. United States Agency for International Development (USAID). (2022). *Zambia: Nutrition profile*. <https://www.usaid.gov/nutrition/countries/zambia-profile-2022>
2. Hoffman, D., Cacciola, T., Barrios, P., & Simon, J. (2017). Temporal changes and determinants of childhood nutritional status in Kenya and Zambia. *Journal of health, population, and nutrition*, 36(1), 27. <https://doi.org/10.1186/s41043-017-0095-z>
3. Dewey K. G. (2013). The challenge of meeting nutrient needs of infants and young children during the period of complementary feeding: an evolutionary perspective. *The Journal of nutrition*, 143(12), 2050–2054. <https://doi.org/10.3945/jn.113.182527>
4. Christides, T., Amagloh, F. K., & Coad, J. (2015). Iron bioavailability and provitamin A from sweet potato- and cereal-based complementary foods. *Foods*, 4(3), 463–476. <https://doi.org/10.3390/foods4030463>
5. Beveridge, M. C., Thilsted, S. H., Phillips, M. J., Metian, M., Troell, M., & Hall, S. J. (2013). Meeting the food and nutrition needs of the poor: the role of fish and the opportunities and challenges emerging from the rise of aquaculture. *Journal of fish biology*, 83(4), 1067–1084. <https://doi.org/10.1111/jfb.12187>
6. Bogard, J. R., Hother, A. L., Saha, M., Bose, S., Kabir, H., Marks, G. C., & Thilsted, S. H. (2015). Inclusion of Small Indigenous Fish Improves Nutritional Quality During the First 1000 Days. *Food and nutrition bulletin*, 36(3), 276–289. <https://doi.org/10.1177/0379572115598885>
7. Roos, N., Islam, M., & Thilsted, S. H. (2003). Small fish is an important dietary source of vitamin A and calcium in rural Bangladesh. *International journal of food sciences and nutrition*, 54(5), 329–339. <https://doi.org/10.1080/09637480120092125>
8. Roos, N., Wahab, M. A., Chamnan, C., & Thilsted, S. H. (2007). The role of fish in food-based strategies to combat vitamin A and mineral deficiencies in developing countries. *The Journal of nutrition*, 137(4), 1106–1109. <https://doi.org/10.1093/jn/137.4.1106>

9. Hibbeln, J. R., Davis, J. M., Steer, C., Emmett, P., Rogers, I., Williams, C., & Golding, J. (2007). Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. *Lancet*, 369(9561), 578–585.
[https://doi.org/10.1016/S0140-6736\(07\)60277-3](https://doi.org/10.1016/S0140-6736(07)60277-3)
10. Imhoff-Kunsch, B., Briggs, V., Goldenberg, T., & Ramakrishnan, U. (2012). Effect of n-3 long-chain polyunsaturated fatty acid intake during pregnancy on maternal, infant, and child health outcomes: a systematic review. *Paediatric and perinatal epidemiology*, 26 Suppl 1, 91–107.
<https://doi.org/10.1111/j.1365-3016.2012.01292.x>
11. Akombi, B. J., Agho, K. E., Hall, J. J., Wali, N., Renzaho, A. M. N., & Merom, D. (2017). Stunting, Wasting and Underweight in Sub-Saharan Africa: A Systematic Review. *International journal of environmental research and public health*, 14(8), 863.
<https://doi.org/10.3390/ijerph14080863>
12. Ekholuenetale, M., Tudeme, G., Onikan, A., & Ekholuenetale, C. E. (2020). Socioeconomic inequalities in hidden hunger, undernutrition, and overweight among under-five children in 35 sub-Saharan Africa countries. *Journal of the Egyptian Public Health Association*, 95(1), 9.
<https://doi.org/10.1186/s42506-019-0034-5>
13. Muthayya, S., Rah, J. H., Sugimoto, J. D., Roos, F. F., Kraemer, K., & Black, R. E. (2013). The global hidden hunger indices and maps: an advocacy tool for action. *PloS one*, 8(6), e67860.
<https://doi.org/10.1371/journal.pone.0067860>
14. World Bank. (2018). *All hands on deck: Reducing stunting through multisectoral efforts in sub-Saharan Africa*. World Bank, Washington, D.C.: World Bank. <http://hdl.handle.net/10986/30119>
15. von Grebmer, K., Bernstein, J., Resnick, D., Wiemers, M., Reiner, L., Bachmeier, M., et al. (2022). *2022 Global Hunger Index: Food systems transformation and local governance*. Bonn: Welthungerhilfe; Dublin: Concern Worldwide. 60 pp.
<https://www.globalhungerindex.org/pdf/en/2022.pdf>

16. UNICEF. (2021). *Country profiles for early childhood development: Zambia*. Washington, D.C.: UNICEF. <https://nurturing-care.org/zambia-2021/>
17. Cole, S. M., McDougall, C., Kaminski, A. M., Kefi, A. S., Chilala, A., & Chisule, G. (2018). Postharvest fish losses and unequal gender relations: Drivers of the social-ecological trap in the Barotse Floodplain fishery, Zambia. *Ecology and Society*, 23, 18. <https://doi.org/10.5751/ES-09950-230218>
18. Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013). The Women's Empowerment in Agriculture Index. *World Development*, 52, 71-91. <http://dx.doi.org/10.1016/j.worlddev.2013.06.007>
19. Coates, J., Swindale, A., & Bilinsky, P. (2007). *Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide (version 3)*. Washington, D.C: FHI 360 and USAID Food and Nutrition Technical Assistance III Project (FANTA). <https://www.fantaproject.org/monitoring-and-evaluation/household-food-insecurity-access-scale-hfias>
20. Ballard, T., Coates, J., Swindale, A., & Deitchler, M. (2011). *Household Hunger Scale: Indicator definition and measurement guide*. Washington, D.C.: Food and Nutrition Technical Assistance II Project (FANTA 2), FHI 360. <https://www.fantaproject.org/sites/default/files/resources/HHS-Indicator-Guide-Aug2011.pdf>
21. Deitchler, M., Ballard, T., Swindale, A., & Coates, J. (2010). *Validation of a measure of household hunger for cross-cultural use*. Washington, D.C.: Food and Nutrition Technical Assistance II Project (FANTA 2), FHI 360. https://www.fantaproject.org/sites/default/files/resources/HHS_Validation_Report_May2010_0.pdf

22. Madrelle, J., Lange, C., Boutrolle, I., Valade, O., Weenen, H., Monnery-Patris, S., Issanchou, S., & Nicklaus, S. (2017). Development of a new in-home testing method to assess infant food liking. *Appetite*, *113*, 274–283. <https://doi.org/10.1016/j.appet.2017.03.002>
23. Puri, S., Rekhi, T. K., Thomas, T., Jadhav, M. H., Mannar, V., & Diosady, L. L. (2022). Sensory trial of Quintuple Fortified Salt-Salt fortified with iodine, iron, folic acid, Vitamin B12, and zinc among consumers in New Delhi, India. *Food and nutrition bulletin*, *43*(3), 340–350. <https://doi.org/10.1177/03795721221078361>
24. Schwartz, C., Issanchou, S., & Nicklaus, S. (2009). Developmental changes in the acceptance of the five basic tastes in the first year of life. *British journal of nutrition*, *102*(9), 1375–1385. <https://doi.org/10.1017/S0007114509990286>
- Sutrisna, A., Vossenaar, M., Izwardy, D., & Tumilowicz, A. (2017). Sensory evaluation of foods with added micronutrient powder (MNP) “Taburia” to assess acceptability among children aged 6-24 months and their caregivers in Indonesia. *Nutrients*, *9*(9), 979. <https://doi.org/10.3390/nu9090979>
25. National Institute of Medicine (IOM). (2006). *Dietary reference intakes: the essential guide to nutrient requirements*. Washington, D.C.: The National Academies Press. <https://doi.org/10.17226/11537>
26. National Institute of Medicine (IOM). (2011). *Dietary reference intakes for calcium and Vitamin D*. Washington, D.C.: The National Academies Press. <https://doi.org/10.17226/13050>
27. Food & Drug Administration (FDA). (2023). *Technical information on development of FDA/EPA advice about eating fish for those who might become or are pregnant or breastfeeding and children ages 1-11 years*. Silver Spring, Maryland: FDA. <https://www.fda.gov/food/environmental-contaminants-food/technical-information-development-fdaepa-advice-about-eating-fish-those-who-might-become-or->

[are#:~:text=Highest%20allowable%20average%20mercury%20concentration,week%20%3D%200.15%20%C2%B5g%2Fg](#)

28. Hyde, E., Greene, M. E., & Darmstadt, G. L. (2020). Time poverty: Obstacle to women's human rights, health and sustainable development. *Journal of global health, 10*(2), 020313.
<https://doi.org/10.7189/jogh.10.020313>
29. Blackden, C. M., & Wodon, Q. (2006) *Gender, time use, and poverty in sub-Saharan Africa*. World Bank Working Paper No. 73. Washington, D.C.: World Bank.
<https://openknowledge.worldbank.org/handle/10986/7214>
30. Whillans, A., & West, C. (2022). Alleviating time poverty among the working poor: a pre-registered longitudinal field experiment. *Scientific reports, 12*(1), 719.
<https://doi.org/10.1038/s41598-021-04352-y>
31. Iannotti, L. L., Blackmore, I., Cohn, R., Chen, F., Gyimah, E. A., Chapnick, M., & Humphries, A. (2022). Aquatic Animal Foods for Nutrition Security and Child Health. *Food and nutrition bulletin, 43*(2), 127–147. <https://doi.org/10.1177/03795721211061924>

Appendix 1: Sensory Panel I & III—Evaluation Forms

Mothers' Acceptability Scale (Scale 1)

1. How well do you like the aroma / smell of the food? (AROMA / SMELL)



2. How well do you like the appearance of the food? (APPEARANCE)



3. How well do you like the way the food feels in your mouth? (MOUTH FEEL / TEXTURE)



4. How well do you like the flavor / taste of the food? (FLAVOR / TASTE)



5. How well do you like the sweetness of the food? (SWEETNESS)



6. How well do you like or dislike how easy food will be to use in an infant's meal at least once per day? (CONVENIENCE)



7. Overall, how well do you like the food? (OVERALL ACCEPTIBILITY)



LEGEND



1
Dislikes very
much



2
Dislikes



3
Neither likes
nor dislikes



4
Likes



5
Likes very
much

Appendix 2: Sensory Panel II—Evaluation Form

Infants' Acceptability Scale for Mothers (Scale 2)

1. GLOBAL LIKING – 5-POINT SUBSCALE: Time 1-Time 3 (T1-T3)

T1: After FIRST 3 SPOONFULS OF FOOD: How well does your child like the food?



T2: After SECOND 3 SPOONFULS OF FOOD: How well does your child like the food?



T3: After FINAL 3 SPOONFULS OF FOOD: How well does your child like the food?



2. Estimate of your child's ACTUAL food intake during this meal (assess at END of meal)



3. Estimate of your child's RELATIVE food intake for this meal as compared how much they usual eat during a meal at this time of day (assess at END of meal)



4. Mother's comments: How many portions did your child eat? _____

Describe any feeding situation (e.g., Was child was breastfed right before taste-test?, was child tired?, etc.):

Appendix 3: Outputs/Dissemination—103 entries

Peer-Reviewed Manuscripts: 3 (1 published; 2 under review)

1. Oaks, B.M., Gyimah, E.A., Kleban, E., Ragsdale, K., & Iannotti, L.L. (Submitted June 24, 2023). Mollusk and crustacean consumption in the first 1,000 days: a systematic review. *Nutrition Research Reviews*.
2. Ragsdale, K., Read-Wahidi, M.R., Mudege, N.M., Iannotti, L., Muzungaire, L., & Funduluka, P. (Revised/Resubmitted July 6, 2023). Sensory panel results of a Dried Fish Powder supplement among caregivers and young children in Zambia. *Public Health Nutrition*.
3. Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., Torell, E. & Kolbila, R. (2022). Adapting the WEAI to explore gender equity among fishers, processors, and sellers/traders at Zambia's Lake Bangweulu. *World Development*, 152, 105821. <https://doi.org/10.1016/j.worlddev.2022.105821>

Technical Reports: 11

1. Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Kakwasha, K., & Kolbila, R. (2023, July). *Executive Summary: ComFA+Fish: Supporting Fish for Zambia in the First 1,000 Days of Life*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 2 pp.
2. Ragsdale, K., Mudege, N., Banda, S., Read-Wahidi, M., Muzungaire, L., & Kolbila, R. (2023, July). *Technical Brief: Complementary Food for Africa+Dried Fish Powder (ComFA+Fish)—Sensory Panels III Results for Two ComFA+Fish Instant Porridges*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 3 pp.
3. Mudege, N., Ragsdale, K., Kakwasha, K., Read-Wahidi, M., Muzungaire, L., & Kolbila, R. (2023, July). *Technical Brief: Complementary Food for Africa+Dried Fish Powder (ComFA+Fish)—Scaling Recommendations*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 7 pp.
4. Mudege, N., Ragsdale, K., Read-Wahidi, M., Chileya, A., Muzungaire, L., Kolbila, R., & Kakwasha, K. (2023, July). *FishFirst! Zambia: Phase III Learning Event and Workshop Report*. USAID, Feed the Future Innovation Lab for Fish, Social Science Research Center, Mississippi State University, WorldFish. 24 pp.
5. Ragsdale, K., Mudege, N., Read-Wahidi, M., Iannotti, L., & Muzungaire, L. (2023, June). *Technical Brief: Complementary Food for Africa+Dried Fish Powder (ComFA+Fish) – Nutrient Analysis and Sensory Panels I-II Results*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 4 pp. https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/2023/06/2023_BRIEF_Ragsdale%20et%20al_ComFA%2BFish_NUTRI%20ANALY%2BPANEL%20I-II_06-25-23_FINAL.pdf

6. Funduluka, P., Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Kolbila, R., Muzungaire, T., & Chirwa, L. (2022, November). *Nutrition Workshop and Cooking Demonstrations Report: FishFirst! Zambia Research for Development and Scaling up Staple-Fish Products for Enhanced Nutrition*. Lusaka: Zambia, WorldFish. 24 pp.
7. Funduluka, P., Ragsdale, K., Mudege, N.N., Read-Wahidi, M., Muzungaire, L., Kolbila, R., Muzungaire, T., & Chirwa, L. (2022, November). *Stakeholder Analysis and Environment Scanning Report: FishFirst! Zambia Research for Development and Scaling up Staple-Fish Products for Enhanced Nutrition*. Lusaka: Zambia, WorldFish. 32 pp.
8. Funduluka, P., Ragsdale, K., Mudege, N.N., Read-Wahidi, M., Muzungaire, L., Kolbila, R., Muzungaire, T., & Chirwa, L. (2022, November). *Sensory Panels I-II Report: FishFirst! Zambia Research for Development and Scaling up Staple-Fish Products for Enhanced Nutrition*. Lusaka: Zambia, WorldFish. 38 pp.
9. Ragsdale, K., Read-Wahidi, M. R. & Torell, E. (2022, January). *Post-Harvest Fish Loss Assessment for Small-Scale Fisheries (PHFLA): An Open-Access Customizable Tool*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 9 pp.
https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/inline-files/Ragsdale%20et%20al_PHFLA_Survey%20Tool_FINAL_2.pdf
10. Ragsdale, K., Marinda, P., Read-Wahidi, M.R., Pincus, L., Torell, E., Kolbila, R., Mulilo, T., Sakapaji, R., Tembo, M., & Ingouf, L. (2019, November 18). *Fish4Zambia Report: Gender Disaggregated WEFI Results. Research in Zambia's Lake Bangweulu Region among Fishers, Processors and Traders*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 41 pp.
11. Ragsdale, K., Marinda, P., Read-Wahidi, M.R., Pincus, L., & Torell, E. (2019, August 28). *Fish4Zambia Trip Report: July 14-July 28*. USAID, Feed the Future Innovation Lab for Fish. Social Science Research Center, Mississippi State University. 22 pp

Invited Presenters | Discussants: 17

1. Ragsdale, K., Mudege, N., Read-Wahidi, M.R., Muzungaire, L., Kolbila, R., & Kakwasha, K. (2023, June). *FishFirst! Zambia: ComFA+Fish Phase II Sensory Panels I-II Results*. FishFirst! Zambia & i2i: USAID Debriefing. Feed the Future Innovation Lab for Fish. USAID Mission / Zambia, American Embassy, Lusaka. June 9, 2023. [Invited Presenter].
2. Kolbila, R., Muzungaire, L., Ragsdale, K., Mudege, N., Read-Wahidi, M.R., & Kakwasha, K. ORGANIZERS & PRESENTERS. (2023, June). *FishFirst! Zambia Phase III: Taste-Testing Two Instant Porridges for Scaling ComFA+Fish*. FishFirst! Zambia & i2i: USAID Debriefing. Feed the Future Innovation Lab for Fish. USAID Mission / Zambia, American Embassy, Lusaka. June 9, 2023. [Invited Presenter].
3. Ragsdale, K., & Mudege, N. (2023, February). *Advancing Nutrition Panel*. Feed the Future Innovation Lab for Fish 2023 Annual Meeting, New Orleans, LA, February 28, 2023. [Invited Panel Participant].

4. Ragsdale, K., & Read-Wahidi, M. (2023, February). *Mainstreaming Gender Equity & Youth Inclusion Panel*. Feed the Future Innovation Lab for Fish 2023 Annual Meeting, New Orleans, LA, February 27, 2023. [Invited Panel Organizer].
5. Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Kolbila, R., & Kakwasha, K. (2023, February). *FishFirst! Zambia – ComFA+Fish: Pilot-Testing a Novel Fish-Based Protein/Micronutrient Blend (PMB) for Nutrition-Insecure Infants*. Feed the Future Innovation Lab for Fish 2023 Annual Meeting, New Orleans, LA, February 27, 2023. [Invited Presenter].
6. Ragsdale, K., Read-Wahidi, M. (2023, February). *USAID Product Life Cycle (PLC) Framework – Innovation to Impact (i2i) Learning Event*, Bureau for Resilience and Food Security, United States Agency for International Development (USAID) and Feed the Future Soybean Innovation Lab Innovation to Impact (i2i), Washington DC, February 22, 2023. [Invited Participant].
7. Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., & Funduluka, P. (2022, September). *FishFirst! Zambia: Sensory Trials Results for ComFA+ Fortified Foods at Lake Kariba*. Feed the Future Innovation Lab Directors Meeting, USAID, Feed the Future. September 21, 2022. [Invited Presenter, Virtual].
https://mstate-my.sharepoint.com/:v:/g/personal/esc88_msstate_edu/EeA3UXbf57pOu0iBXpTyGBEBmWQ5R5tUlxe6ih53y_WKTW?e=pgRuUz
8. Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Kolbila, R., Funduluka, P., & Muzungaire, T. (2022, August). *FishFirst! Zambia: Lake Kariba ComFA+ Taste-Tests and Nutrition Trainings*. Feed the Future Innovation Lab for Fish 2022 Virtual Annual Meeting, August 8-10, 2022. [Invited Presenter, Virtual].
9. Ragsdale, K. (2022, April). *Quick Guide to Giving Great Scientific Presentations* [Webinar]. Fish Innovation Lab Student Network Event. USAID Feed the Future Innovation Lab for Fish. April 13, 2022. [Invited Presenter, Virtual].
<https://rhody.webex.com/rhody/ldr.php?RCID=b58c4762f0f30de2f1dc6a76159aa81c>
10. Wamukota, A., Kamu, E., Iannotti, L., Ragsdale, K., Read-Wahidi, M.R., Oaks, B., Tolar-Peterson, T., Adegoye, G., & Pincus, L. (2021, October). *Using Fish to Mitigate Malnutrition: Research to Test Innovative, Sustainable Approaches*. Roundtable Discussion Pre-Event. 2021 Norman E. Borlaug International Dialogue Side Event, World Food Prize Foundation. October 19, 2021. [Invited Discussant, Virtual].
<https://www.fishinnovationlab.msstate.edu/events/2021/09/using-fish-mitigate-malnutrition-research-test-innovative-sustainable-approaches>
11. Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., Torell, E. & Kolbila, R. (2021, September). *Fish4Zambia: Focusing a Gender Lens on Household-level Hunger among Lake Bangweulu Fisher Families*. Oral Presentation. 2021 SSRC Brown Bag Speaker Series, Social Science Research Center, Mississippi State University, September 16, 2021. [Invited Presenter, Virtual].
12. Ragsdale, K., Mudege, N., Marinda, P., & Read-Wahidi, M. (2021, August). *Adapting the Household Hunger Scale to explore individual and household food security at Lake Kariba*.

Oral Presentation. Fish Innovation Lab Annual Meeting, August 9-11, 2021. [Invited Presenter, Virtual].

13. Mudege, N., Marinda, P., Ragsdale, K., & Read-Wahidi, M. R. (2021, July). FIL Learning Event: Africa/Asia Fisheries Meeting. Invited Discussants. Fish Innovation Lab, July 8, 2021. [Invited Discussant, Virtual].
14. Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., Torell, E. & Kolbila, R. *Fish4Zambia: Gender Disaggregated WEFI Results among Lake Bangweulu Fishers, Processors, and Traders*. Feed the Future Innovation Lab for Fish – Quick Start Final Presentations, November 10, 2020. [Invited Presenter, Virtual].
<https://www.fishinnovationlab.msstate.edu/node/191>
15. Marinda, P., Ragsdale, K., Read-Wahidi, M., Kolbila, R., Pincus, L., & Torell, E. *Fish4Zambia: Research to Close Fish Consumption and Nutrition Gaps in Zambia's Lake Bangweulu Region*. Nutrition-Sensitive Fish Agri-Food Systems Workshop, Lusaka, Zambia, February 24, 2020. [Presenter, Virtual].
16. Marinda, P., & Ragsdale, K. *Talent is Universal; Opportunity is Not: Why Gender Equity and Youth Inclusion are Vital for Aquaculture and Fisheries Development*. Feed the Future Innovation Lab for Fish, Principal Investigator Virtual Platform Meeting, Mississippi State University, September 27, 2019. [Invited Presenter, Virtual].
17. Ragsdale, K., Marinda, P., Read-Wahidi, M., Pincus, L., & Torell, E. *Fish4Zambia: Research to Close Fish Consumption and Nutrition Gaps in Zambia*. Feed the Future Innovation Labs Principal Investigator Meeting, Washington, DC, September 12, 2019. [Invited Presenter].

Trainings & Workshops Organized & Facilitated: 11

1. Kakwasha, K., Mudege, N., Muzungaire, L., Ragsdale, K., Read-Wahidi, M. R., & Kolbila, R. (2023, June). *FishFirst! Zambia Learning Event 4. Scaling Readiness Assessment for ComFA+Fish Instant Porridges*. FishFirst! Zambia: Phase III Learning Event & Workshop, USAID Feed the Future Innovation Lab for Fish. Lake Safari Lodge, Siavonga District, Southern Province, Zambia. June 7, 2023. [38 attendees].
https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/inline-files/2023_LEARN.EVENT_3_Kakwasha%20et%20al_Scaling%20Readiness_06-07-23%20%282%29.pdf
2. Kolbila, R., Ragsdale, K., Mudege, N., Read-Wahidi, M. R., Muzungaire, L., Marinda, P., & Kakwasha, K. (2023, June). *FishFirst! Zambia Learning Event 3. Household Hunger Scale II: Lake Kariba Fishing Families and Food Insecurity*. FishFirst! Zambia: Phase III Learning Event & Workshop, USAID Feed the Future Innovation Lab for Fish. Lake Safari Lodge, Siavonga District, Southern Province, Zambia. June 6, 2023. [40 attendees].
https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/inline-files/2023_LEARN.EVENT_2_Kolbila%20et%20al_HHS%20II_06-06-23%20%282%29.pdf
3. Chileya, A., Muzungaire, L., Mudege, N., Ragsdale, K., & Read-Wahidi, M. R. (2023, June). *FishFirst! Zambia Learning Event 2. FishFirst! Zambia Video: 2022 Nutrition Training Highlights*. FishFirst! Zambia: Phase III Learning Event & Workshop, USAID

Feed the Future Innovation Lab for Fish. Lake Safari Lodge, Siavonga District, Southern Province, Zambia. June 6, 2023. [40 attendees].

4. Ragsdale, K., Mudege, N., Read-Wahidi, M. R., Muzungaire, L., Kolbila, R., & Kakwasha, K. (2023, June). *FishFirst! Zambia Learning Event 1. ComFA+Fish Sensory Panels I-II Results*. FishFirst! Zambia: Phase III Learning Event & Workshop, USAID Feed the Future Innovation Lab for Fish. Lake Safari Lodge, Siavonga District, Southern Province, Zambia. June 6, 2023. [40 attendees].
https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/inline-files/2023_USAID_1_Ragsdale%20et%20al_FFZ_Sensory%20Panels_06-09-23%20%284%29.pdf
5. Ragsdale, K., Mudege, N., Read-Wahidi, M. R., Muzungaire, L., Kolbila, R., Funduluka, P., & Muzungaile, T. (2022, June). *FishFirst! Zambia: Nutrition for Healthy Women and Children*. [Fish-focused nutrition training targeting 42 mother-infant pairs, Community Health Volunteers (CHV), entrepreneurs/businesses, Department of Health officers, Department of Fisheries officers, and political leaders for the Districts of Gwembe, Siavonga, and Sinazongwe]. USAID Feed the Future Innovation Lab for Fish. Freshview Hotel, Siavonga, Zambia. June 21, 2022. [66 attendees].
6. Ragsdale, K., Mudege, N., Read-Wahidi, M. R., Muzungaire, L., Kolbila, R., Funduluka, P., & Muzungaile, T. (2022, June). *FishFirst! Zambia: ComFA+Fish Cooking Demonstration and Kapenta Nutrition Training*. [Cooking demonstration/nutrition training focused on using Kapenta/Dried Fish Powder in four dishes targeting 42 mother-infant pairs, Community Health Volunteers (CHV), entrepreneurs/businesses, Department of Health officers, Department of Fisheries officers, and political leaders for the Districts of Gwembe, Siavonga, and Sinazongwe]. USAID Feed the Future Innovation Lab for Fish. Indaba Pub & Grill, Siavonga, Zambia. June 21, 2022. [66 attendees].
7. Ragsdale, K., Mudege, N., Read-Wahidi, M. R., Muzungaire, L., Kolbila, R., Funduluka, P., & Muzungaile, T. (2022, June). *FishFirst! Zambia: ComFA+Fish Micro-Enterprise/Entrepreneur Training*. [Training focused on using Kapenta/Dried Fish Powder in two dishes and on entrepreneurial use of Dried Fish Powder and other nutrient-rich food powders targeting 42 mother-infant pairs, Community Health Volunteers (CHV), entrepreneurs/businesses, Department of Health officers, Department of Fisheries officers, and political leaders for the Districts of Gwembe, Siavonga, and Sinazongwe]. USAID Feed the Future Innovation Lab for Fish. Indaba Pub & Grill, Siavonga, Zambia. June 22, 2022. [77 attendees].
8. Ragsdale, K., & Read-Wahidi, M. R. ORGANIZERS. *Confronting Hidden Hunger: How Fish Can Help Fill Health Gaps Around the World* by Dr. Lora Iannotti, Brown School, Washington University in St. Louis. Invited Presentation supported by the Social Science Research Center and the Global Center for Aquatic Health and Food Security, Mississippi State University, Starkville, MS, February 9, 2022. [Note: This presentation was part of a three-day working group visit organized by Drs. Ragsdale and Read-Wahidi for Dr. Iannotti.]
<https://www.fishinnovationlab.msstate.edu/events/2022/02/confronting-hidden-hunger-how-fish-can-fill-health-gaps-around-world>
9. Ragsdale, K., Read-Wahidi, M.R., Mudege, N., & Marinda, P. (2021). *FishFirst! Zambia: Closing Fish Consumption and Nutrition Gaps in Zambia - Enumerator Training Workshop*.

USAID Feed the Future Fish Innovation Lab, Lusaka, Zambia, May 7-9, 2021. [Note: Two-day training workshop for Zambian Department of Fisheries Field Agents].

10. Ragsdale, K., & Read-Wahidi, M. R. ORGANIZERS. *Gender Dynamics in Smallscale Fisheries and Aquaculture* by Dr. Steven Cole, International Institute of Tropical Agriculture (IITA)-Tanzania. Invited Presentation supported by the USAID Feed the Future Fish Innovation Lab and the Social Science Research Center, Mississippi State University, Starkville, MS, February 6, 2020. [Note: Presentation was part of a three-day working group visit organized by Drs. Ragsdale and Read-Wahidi for Dr. Cole.]
<https://www.fishinnovationlab.msstate.edu/events/2020/01/gender-dynamics-small-scale-fisheries-and-aquaculture>
11. Ragsdale, K., Pincus, L., Read-Wahidi, M.R., Marinda, P., Torell, E. & Mulilo, T. (2019). *Fish4Zambia WEFI: Training Workshop for Enumerators: Closing Fish Consumption and Nutrition Gaps in Zambia*. USAID Feed the Future Fish Innovation Lab, Samfya, Zambia, July 18, 2019. [Note: Full-day training workshop for Zambian Department of Fisheries Field Agents].

Refereed Scientific Conference Presentations: 27

1. Kolbila, R., Ragsdale, K., Mudege, N.M., Read-Wahidi, M.R., Muzungaire, L., Iannotti, L., & Kakwasha, K. (2023). *Leveraging the Private Sector in Testing and Scaling FishFirst! Zambia's ComFA+Fish Protein/Micronutrient Blend for Instant Complementary Porridges and Other Zambian Dishes*. Submitted Poster Presentation. Borlaug Dialogue, World Food Prize. Des Moines, Iowa. October 24-26, 2023.
2. Mudege, N.M., Ragsdale, K., Read-Wahidi, M.R., Muzungaire, L., Iannotti, L., Kolbila, R., & Kakwasha, K. (2023). *FishFirst! Zambia: Engaging Private Sector Actors in Scaling ComFA+Fish Protein/Micronutrient Blends and Testing Four ComFA+Fish-fortified Traditional Dishes and Two Instant Complementary Porridges*. Submitted Poster Presentation. Micronutrient Forum 6th Global Conference. The Hague, Netherlands. October 16-20, 2023.
3. Smith, M., Ragsdale, K., Mudege, N.M., Read-Wahidi, M.R., Muzungaire, L., Iannotti, L., Kolbila, R., Kakwasha, K. (2023). *FishFirst! Zambia: Engaging Private Sector Actors in Scaling ComFA+Fish Protein/Micronutrient Blends and Testing Four ComFA+Fish-fortified Traditional Dishes and Two Instant Complementary Porridges*. Submitted Poster Presentation. Mississippi State University: 2023 Summer Undergraduate Research Symposium. Mississippi State, MS. August 2, 2023.
4. Ragsdale, K., Read-Wahidi, M., Mudege, N., Marinda, P., & Kolbila, R. (2023). *Using a Gender Lens to Explore Food Insecurity among Rural Fishers, Processors, and Fish Traders at Zambia's Lake Kariba: Results from the Household Hunger Scale II*. Accepted Oral Presentation. Nutrition 2023 Conference, American Society for Nutrition. Boston, MA. July 22-25, 2023.
5. Sawyer, N., Ragsdale, K., Mudege, N., Read-Wahidi, M., Marinda, P., Muzungaire, L., Kakwasha, K., & Kolbila, R. (2023). *Adapting the Household Hunger Scale to Collect Food Insecurity Data at Both the Individual- and Household-Level at Zambia's Lake Kariba*. Poster Presentation. Mississippi State University: 2023 Spring Undergraduate Research Symposium. Mississippi State, MS. April 13, 2023.

6. Smith, M., Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Funduluka, P., Muzungaire, T., Kakwasha, K., & Kolbila, R. (2023). *FishFirst! Zambia Nutrition-Related Activities: Encouraging Fish Consumption Among Vulnerable Mother-Infant Dyads at Lake Kariba*. Poster Presentation. Mississippi State University: 2023 Spring Undergraduate Research Symposium. Mississippi State, MS. April 13, 2023.
7. Kolbila, R., Ragsdale, K., Mudege, N., Read-Wahidi, M., Marinda, P., Muzungaire, L., & Kakwasha, K. (2023). *FishFirst! Zambia: Exploring Multi-Level Food Insecurity among Small-scale Capture Fishery Households at Lake Kariba*. Poster Presentation. Feed the Future Innovation Lab for Fish 2023 Annual Meeting. New Orleans, LA. February 27-March 1, 2023.
8. Muzungaire, T., Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Funduluka, P., Kakwasha, K., & Kolbila, R. (2023). *FishFirst! Zambia Phase II Underscores Importance of Fish in the First 1,000 Days Among Mothers in Fishing Households at Lake Kariba*. Poster Presentation. Feed the Future Innovation Lab for Fish 2023 Annual Meeting. New Orleans, LA. February 27-March 1, 2023.
9. Ragsdale, K., Read-Wahidi, M., Mudege, N., Marinda, P., & Kolbila, R. (2022). *FishFirst! Zambia: Research on Individual- and Household-Level Food Insecurity among Vulnerable Communities at Lake Kariba*. Oral Presentation. 150th American Public Health Association (APHA) Annual Meeting. Boston, MA. November 9, 2022.
10. Kolbila, R., Muzungaire, T., Issac, A., Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., & Funduluka, P. (2022). *Preliminary Results for Mothers' ComFA+ Taste-Tests at Lake Kariba: FishFirst! Zambia Phase II*. Poster Presentation. Feed the Future Innovation Lab for Fish 2022 Virtual Annual Meeting. August 8-10, 2022. [Virtual]
11. Issac, A., Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., Kolbila, R., Funduluka, P., & Muzungaire, T. (2022). *FishFirst! Zambia Phase II: Conducting Nutrition Trainings and ComFA+ Taste-Tests Among Mother-Infant Pairs at Lake Kariba*. Poster Presentation. Mississippi State University: 2022 Summer Undergraduate Research Symposium. Mississippi State, MS. August 2, 2022.
12. Ragsdale, K., Read-Wahidi, M., Mudege, N., Marinda, P., & Kolbila, R. *Focusing a Gender Lens on Household Food Security among Vulnerable Lake Kariba Fisher Families: Household Hunger Scale II Results*. Accepted Oral Presentation. International Conference on Quality Control, Gender and Food Security. London, United Kingdom. June 27-28, 2022.
13. Chisopo, A., Marinda, P., Mudege, N., Read-Wahidi, M., Ragsdale, K., Kolbila, R., & Smith, M. (2022, April). *Post-Harvest Fish Loss and Impacts on Smallscale Fishery Livelihoods in Zambia and Adjacent Countries: A FishFirst! Zambia Literature Review*. Poster Presentation. Mississippi State University: 2022 Spring Undergraduate Research Symposium. Mississippi State, MS. April 13, 2022.
14. Malama, F., Marinda, P., Mudege, N., Read-Wahidi, M., Ragsdale, K., Kolbila, R., & Issac, A. (2022, April). *Fish Consumption and Related Nutritional Status Among Women and Young Children in Zambia and Adjacent Countries: A FishFirst! Zambia Literature Review*. Poster Presentation. Mississippi State University: 2022 Spring Undergraduate Research Symposium. Mississippi State, MS. April 13, 2022.

15. Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Mudege, N., & Kolbila, R. (2021, October). *Using Fish to Mitigate Malnutrition: Research to Test Innovative, Sustainable Approaches*. Roundtable Discussion. 2021 Borlaug International Dialogue Side Event. World Food Prize Foundation. October 19, 2021. [Virtual].
<https://youtu.be/qwJ6bKD4pdQ>
16. Ragsdale, K., Castellanos, P., Sumner, D., O'Brien, C., Read-Wahidi, M., Garner, E., & Rhoads, J. (2021, October). *Gender Across USAID's Feed the Future Innovation Labs: Lessons and Approaches that Cultivate Gender-Transformative Agricultural Development*. Panel Session. Cultivating Equality Conference 2021: Advancing Gender Research in Agriculture and Food Systems. CGIAR Gender Platform; Wageningen University & Research. October 12, 2021. [Virtual].
<https://youtu.be/8HzFXYM320I>
17. Chisopo, A., Marinda, P., Mudege, N., Read-Wahidi, M.R., & Ragsdale, K. (2021, August). *Impact of post-harvest loss on men and women small-scale fishery livelihoods in Zambia and adjacent countries*. Poster Presentation. Fish Innovation Lab Annual Meeting. August 9-11, 2021. [Virtual]
18. Kolbila, R., Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., & Torell, E. (2021). *Household-level hunger among men and women in Zambia's Luapula Province: What can disaggregating self-reported data by gender tell us about food insecurity?* Poster Presentation. Fish Innovation Lab Annual Meeting. August 9-11, 2021. [Virtual]
19. Malama, F., Marinda, P., Mudege, N., Read-Wahidi, M.R., & Ragsdale, K. (2021). *Fish consumption in Zambia and other sub-Saharan African countries during the first 1000 days and its impact on nutritional status*. Poster Presentation. Fish Innovation Lab Annual Meeting. August 9-11, 2021. [Virtual]
20. Ragsdale, K., Mudege, N., Marinda, P., & Read-Wahidi, M. R. (2021). *Adapting the Household Hunger Scale to explore individual and household food security at Lake Kariba*. Oral Presentation, Fish Innovation Lab Annual Meeting, August 9-11, 2021. [Virtual]
21. Ragsdale, K., Kolbila, R., Marinda, P., Read-Wahidi, MR, Pincus, L., & Torell, E. *Fish4Zambia Preliminary Results: Exploring Food Insecurity Among Men and Women in Zambia's Lake Bangweulu Region*. Accepted Oral Presentation. 81st Society for Applied Anthropology Annual Meeting. Norfolk, VA. March 23-27, 2021. [Converted to virtual meeting due to Covid-19 pandemic.]
22. Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., Torell, E. & Kolbila, R. (2021). *Using the Household Hunger Scale to explore food insecurity among smallscale fishers, processors, and traders at Zambia's Lake Bangweulu: Fish4Zambia Results*. Poster Presentation. 2021 Women and Gender in International Development Conference. Virginia Polytechnic Institute and State University, Blacksburg, VA. February 23-26, 2021. [Virtual]
<https://www.fishinnovationlab.msstate.edu/newsroom/2021/03/fish4zambia-team-presents-2021-women-and-gender-international-development>
23. Ragsdale, K., Marinda, P., Read-Wahidi, M., Pincus, L., Torell, E., & Kolbila, R. (2020). *Fish4Zambia: Exploring food insecurity among fishing value chain actors at Lake*

- Bangweulu*. Poster Presentation. Fourth International Conference on Global Food Security. Montpellier, France. December 7-9, 2021. [Virtual due to Covid-19]
24. Pincus, L., Marinda, P., Ragsdale, K., Read-Wahidi, M.R., & Torell, E. (2020). *Barriers to Fish Consumption in Zambia's Luapula Fishing Communities: Fish4Zambia Preliminary Results*. Accepted Poster Presentation. Fifth Annual Agriculture, Nutrition & Health (ANH) Academy Week. Lilongwe, Malawi. June 29-July 3, 2020. [Rescheduled due to Covid-19]
 25. Ingouf, L., Ragsdale, K., Read-Wahidi, M.R., Kolbila, R., Marinda, P., Pincus, L., & Torell, E. (2020). *Fish4Zambia: Exploring Household-Level Hunger Among Men and Women Engaged in Fishing Activities at Zambia's Lake Bangweulu*. Poster Presentation. Mississippi State University: 2020 Spring Undergraduate Research Symposium. Mississippi State, MS. April 15, 2020. [Cancelled due to Covid-19]
 26. Ragsdale, K., Kolbila, R., Marinda, P., Read-Wahidi, M.R., Pincus, L., & Torell, E. (2020). *Fish4Zambia Preliminary Results: Exploring Food Insecurity Among Men and Women in Zambia's Lake Bangweulu Region*. Accepted Oral Presentation. 80th Society for Applied Anthropology Annual Meeting. Albuquerque, NM. March 19, 2020. [Cancelled due to Covid-19]
 27. Kolbila, R., Ragsdale, K., Marinda, P., Read-Wahidi, M.R., Pincus, L., & Torell, E. (2019). *Using Fish4Zambia Preliminary Results to Explore Food Insecurity Among Men and Women in Zambia's Lake Bangweulu Region*. Oral Presentation. Mississippi State University: 2019 Graduate Research Symposium. Mississippi State, MS. October 5, 2019. Third Place Award, Social Sciences Research.

Digital Footprint | Webinars, Videos, Etc.: 6

1. Ragsdale, K., Mudege, N., Read-Wahidi, M., Muzungaire, L., & Funduluka, P. (2022, September 21). *FishFirst! Zambia: Sensory Trials Results for ComFA+ Fortified Foods at Lake Kariba*. Feed the Future Innovation Lab Directors Meeting, September 21, 2022. [Virtual].
https://mstate-my.sharepoint.com/:v/g/personal/esc88_msstate_edu/EeA3UXbf57pOu0iBXpTyGBEBmWQ5R5tUlxe6ih53y_WKTW?e=pgRuUz
2. Shangala, S., Funduluka, P., Ragsdale, K., Mudege, N., Read-Wahidi, M., & Muzungaire, L. (2022, June). *UNICEF Video: What to Feed Your Young Child: TONGA Translation*. USAID Feed the Future Innovation Lab for Fish.
<https://drive.google.com/file/d/1l3ytu--O7kz3o1qZVFXJxk5Jz-VUwwjn/view>
3. Ragsdale, K. (2022, April). *Quick Guide to Giving Great Scientific Presentation*. Fish Innovation Lab Student Network Event. USAID Feed the Future Innovation Lab for Fish. April 13, 2022. Invited Speaker. [Webinar].
<https://rhody.webex.com/rhody/ldr.php?RCID=b58c4762f0f30de2f1dc6a76159aa81c>
4. Iannotti, L. (2022, February 9). *Confronting Hidden Hunger: How Fish Can Help Fill Health Gaps Around the World*. Invited Presentation at Mississippi State University. Organizers: Ragsdale, K., Read-Wahidi, M. Co-Hosts: Social Science Research Center, Global Center for Aquatic Health and Food Security, Mississippi State University.

<https://www.fishinnovationlab.msstate.edu/events/2022/02/confronting-hidden-hunger-how-fish-can-fill-health-gaps-around-world>

5. Ragsdale, K., Read-Wahidi, M.R., Marinda, P., Pincus, L., Torell, E. & Kolbila, R. (2020, November 10). *Fish4Zambia: Gender Disaggregated WEFI Results among Lake Bangweulu Fishers, Processors, and Traders* [Online presentation]. USAID, Feed the Future Innovation Lab for Fish – Quick Start Final Presentations. <https://www.fishinnovationlab.msstate.edu/node/191>
6. Cole, S. (2020, February 6). *Gender Dynamics in Small-Scale Fisheries and Aquaculture*. Invited Presentation at Mississippi State University. Organizers: Ragsdale, K., & Read-Wahidi, M. R. Supported by USAID, Feed the Future Fish Innovation Lab, Social Science Research Center, Mississippi State University. <https://www.fishinnovationlab.msstate.edu/events/2020/01/gender-dynamics-small-scale-fisheries-and-aquaculture>

Digital Footprint | Research Highlighted on Media Outlets: 28

1. Dismukes, A. (2023, June 20). *MSU Undergraduate Students Serving up Research to Feed Zambians* [Web log post]. USAID Feed the Future Innovation Lab for Fish. <https://www.fishinnovationlab.msstate.edu/newsroom/2023/06/msu-undergraduate-students-serving-research-feed-zambians>
2. Agrilinks. (2023, January 12). *A community health worker becomes a FishFirst! Zambia Champion and local catalyst for change*. [Web log post]. USAID Feed the Future, Agrilinks. [A version of this post was originally authored by A. Chileya, L. Muzungaire, N. Mudege, and K. Ragsdale and posted on the Feed the Future Innovation Lab for Fish site on January 6, 2023]. <https://agrilinks.org/post/community-health-worker-becomes-fishfirst-zambia-champion-and-local-catalyst-change>
3. Chileya, A., Muzungaire, L., Mudege, N., & Ragsdale, K. (2023, January 6). *Betty Muleya: A community health worker becomes a FishFirst! Zambia Champion and local catalyst for change*. [Web log post]. USAID Feed the Future Innovation Lab for Fish. https://www.fishinnovationlab.msstate.edu/sites/www.fishinnovationlab.msstate.edu/files/inline-files/FishFirst%21%20Zambia-success%20story-FY22_0.pdf
4. Dismukes, A. (2022, May 10). *FishFirst! Zambia research scholars present posters at 2022 Spring Undergraduate Research Symposium* [Web log post]. USAID Feed the Future Innovation Lab for Fish. <https://www.fishinnovationlab.msstate.edu/newsroom/2022/05/fishfirst-zambia-research-scholars-present-posters-2022-spring-undergraduate>
5. Agrilinks & Zseleczy, L. (2022, March 29). *Working from the inside out: How the Fish Innovation Lab helps partners integrate gender in their activities*. [Web log post]. USAID Feed the Future, Agrilinks. <https://www.agrilinks.org/post/working-inside-out-how-fish-innovation-lab-helps-partners-integrate-gender-their-activities>

6. Zselezky, L. (2022, March 21). *Turning the mirror inward: Gender integration among Fish Innovation Lab research teams* [Web log post]. USAID Feed the Future Innovation Lab for Fish.
<https://www.fishinnovationlab.msstate.edu/newsroom/2022/03/turning-mirror-inward-gender-integration-among-fish-innovation-lab-research-teams>
7. Ragsdale, K., Read-Wahidi, M. R. & Torell, E. (2022, February 2). *New tool helps quantify post-harvest losses in small-scale capture fisheries* [Web log post]. USAID Feed the Future Innovation Lab for Fish.
<https://www.fishinnovationlab.msstate.edu/newsroom/2022/02/new-tool-helps-quantify-post-harvest-losses-small-scale-capture-fisheries>
8. Zselezky, L. (2021, December 17). *Implementing gender-responsive research activities through the Fish Innovation Lab* [Web log post]. USAID Feed the Future Innovation Lab for Fish.
<https://www.fishinnovationlab.msstate.edu/newsroom/2021/12/implementing-gender-responsive-research-activities-through-fish-innovation-lab>
9. Starkville Daily News. (2021, November 6). *University's Feed the Future projects gain global attention at Borlaug International Dialogue*. [Press release].
<https://www.pressreader.com/usa/starkville-daily-news/20211106/page/2/textview>
10. Brasher, K. (2021, November 4). *University's Feed the Future projects gain global attention at Borlaug International Dialogue*. [Press release]. Mississippi State University, Office of Public Affairs.
<https://www.msstate.edu/newsroom/article/2021/11/msu-feed-future-projects-gain-global-attention-borlaug-international>
11. Feed the Future. (2021, October 28). *Lead Story: How locally sourced fish powder drives women's empowerment and nutrition in Zambia* [Web log post]. USAID Feed the Future Newsletter.
<https://conta.cc/3vSflam>
12. Zselezky, L. (2021, August 26). *Advancing gender-responsive aquaculture and fisheries development starts with identifying common gender barriers* [Web log post]. USAID Feed the Future Innovation Lab for Fish.
<https://www.fishinnovationlab.msstate.edu/newsroom/2021/08/advancing-gender-responsive-aquaculture-and-fisheries-development-starts>
13. Agrilinks. (2021, June 25). *Gender mainstreaming in fisheries and aquaculture sectors* [Web log post]. USAID Feed the Future, Agrilinks. [A version of this post was originally authored by K. Ragsdale, M. Read-Wahidi, and E. Torell and posted on the Feed the Future Innovation Lab for Fish site on March 29, 2021]
<https://www.agrilinks.org/post/gender-mainstreaming-fisheries-and-aquaculture-sectors>
14. Agrilinks. (2021, March 29). *Fish4Zambia: Research among men and women fishers, processors and sellers*. [Web log post]. USAID Feed the Future, Agrilinks. [This post is based on a report originally authored by K. Ragsdale and M. Read-Wahidi and posted on the Feed the Future Innovation Lab for Fish site on March 25, 2021]

<https://agrilinks.org/post/fish4zambia-research-among-men-and-women-fishers-processors-and-sellers>

15. Adams, S. (2021, March 25). *Free online course explains the role of gender in agricultural development* [Web log post]. USAID Feed the Future, Agrilinks. <https://agrilinks.org/post/free-online-course-explains-role-gender-agricultural-development>
16. Zselezky, L. (2021, March 15). *Quick Start Projects yield lessons for gender-responsive aquaculture and fisheries activities* [Web log post]. USAID, Feed the Future Innovation Lab for Fish. <https://www.fishinnovationlab.msstate.edu/newsroom/2021/03/quick-start-projects-yield-lessons-gender-responsive-aquaculture-and-fisheries>
17. Dechert, K. (2020, December 15). *Researchers present at international conference on global food security* [Web log post]. USAID, Feed the Future Innovation Lab for Fish. <https://www.fishinnovationlab.msstate.edu/newsroom/2020/12/researchers-present-international-conference-global-food-security>
18. Creel, E., Ragsdale, K. & Read-Wahidi, M. R. (2020, December 9). *Addressing inequalities at home and abroad: How the Gender Impacts Lab's work covers continents* [Online annual report article]. Annual Report 2020, Social Science Research Center, Mississippi State University. <https://ssrc.msstate.edu/2020-annual-report/>
19. Dechert, K. (2020, March 23). *Internal survey tool will measure gender integration in fisheries and aquaculture* [Web log post]. USAID, Feed the Future Innovation Lab for Fish. <https://www.fishinnovationlab.msstate.edu/newsroom/2020/03/internal-survey-tool-will-measure-gender-integration-fisheries-and-aquaculture>
20. Chmielewski, M. (2020, February 25). *Integrating gender in agriculture research investments* [Web log post]. USAID Feed the Future, Agrilinks. <https://www.agrilinks.org/gender-research>
21. Feed the Future Advancing Women's Empowerment (AWE) Program. (2020, February 25). *How are Feed the Future agricultural research investments integrating gender?* Infographic. USAID Bureau for Food Security. <https://www.agrilinks.org/gender-research>
22. Ragsdale, K. (2020, January 6). *Fish4Zambia builds capacity through student fieldwork training* [Web log post]. USAID, Feed the Future Innovation Lab for Fish. <https://www.fishinnovationlab.msstate.edu/newsroom/2020/01/fish4zambia-builds-capacity-through-student-fieldwork-training>
23. Dechert, K. (2019, September 20). *Feed the Future Week elevating the voices of women around the world: Featuring Annie Mumba, Elin Torell, and Mbonyiwe Chakanga.* [Web log post]. USAID, Feed the Future Innovation Lab for Fish. <https://mailchi.mp/2f4ad03ca1dd/celebrating-feed-the-future-week-by-amplifying-womens-voices-and-contributions>

24. Dechert, K. (2019, August 30). *Fish4Zambia: Assessing facilitators and barriers to aquaculture and fish consumption in Zambia*. USAID, Feed the Future Innovation Lab for Fish.
<https://www.fishinnovationlab.msstate.edu/research/projects/assessing-facilitators-and-barriers-aquaculture-and-fish-consumption-zambia>
25. Dechert, K. (2019, August 30). *Our People: Laura Ingouf* [Online article]. USAID, Feed the Future Innovation Lab for Fish.
<https://www.msstate.edu/our-people/2019/08/laura-ingouf>
26. Feed the Future Innovation Lab for Fish. (2019, August 12). *Improving the fish value chain in Zambia* [Online video]. USAID, Feed the Future Innovation Lab for Fish.
<https://www.fishinnovationlab.msstate.edu/blog/2019/08/improving-fish-value-chain-zambia>
27. Feed the Future Advancing Women's Empowerment (AWE) Program. (2019, November). *Gender integration in USAID's agricultural research investments: A synthesis of key findings and best practices*. Final Report. USAID Bureau for Food Security.
https://www.agrilinks.org/sites/default/files/resources/feed-the-future-awe-co3-final-report-revised_27jan2020.pdf
28. Dechert, K. (2019, November 12). *Identifying barriers to nutrition in Zambia's Lake Bangweulu fishing camps* [Web log post]. USAID Feed the Future, Agrilinks.
<https://www.agrilinks.org/post/identifying-barriers-nutrition-zambias-lake-bangweulu-fishing-camps>