



TECHNICAL BRIEF: COMPLEMENTARY FOOD FOR AFRICA+DRIED FISH POWDER (COMFA+FISH) – SCALING RECOMMENDATIONS

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BACKGROUND

Supported by the USAID-funded Feed the Future Innovation Lab for Fish, FishFirst! Zambia is a joint initiative of researchers at Mississippi State University and WorldFish, which leads the CGIAR initiative on Aquatic Foods. FishFirst! Zambia is focused on research for developing and scaling staple fish products for enhanced nutrition in the first 1,000 days of life (from conception until age 2 years). The activity aims to determine ways of increasing access to nutritious fish among members of vulnerable households, particularly infants and young children (IYC) and pregnant and breastfeeding women. FishFirst! Zambia was implemented in Zambia's Southern Province in the districts of Gwembe, Siavonga, and Sinazongwe. A primary outcome of the FishFirst! Zambia activity was development of a novel, locally sourced, high-quality dried fish-based protein/micronutrient



Mother and infant during FishFirst! Zambia Phase III conducted in 2023 at Lake Kariba. Photo: K. Ragsdale, Mississippi State University

blend we call *Complementary Food for Africa+Dried Fish Powder (ComFA+Fish)*. This technical brief explores options to scale the production and marketing of ComFA+Fish products/recipes across Zambia with tiered in-country partners that include private- and public-sector actors at the national (e.g., school feeding programs), regional (e.g., mid-level entrepreneurs/business owners), and local levels (e.g., woman and youth microentrepreneurs).

This brief is based on the results of the ComFA+Fish Scaling Readiness Exercise conducted as part of FishFirst! Zambia's Phase III Learning Event and Workshop held at Siavonga in June 2023. The scaling readiness tool and approach were adapted from [Sartas et al. \(2020\)](#) and were designed to enable critical reflection on whether a technology/innovation is ready for scaling and, if so, what support mechanisms and actions are needed to accelerate scaling. The research team conducted the assessment among three groups recruited from the study's three districts, including 1) eight mothers and community health workers; 2) five entrepreneurs/ business owners; and 3) 13 government officials (e.g., Ministry of Health personnel, Department of Fisheries personnel, and other government personnel).

NUTRITION PRIORITIES: MOTHERS AND COMMUNITY HEALTH WORKERS

The eight mothers and community health workers (CHWs) reported that providing nutritious and diverse diets was crucial to promoting IYC's healthy growth, and foods such as Kapenta, Tilapia, groundnut, and dark green leafy vegetables are important foods for IYC. They reported that because of the FishFirst! Zambia Phase II nutrition trainings/cooking demonstrations in which they participated in 2022, they now provide their IYC with more nutritious foods and seek to raise nutritional awareness among other mothers in their communities.

However, they also mentioned that they have not been able to reach many mothers in their communities and feel that many IYC “still do not get enough nutritious foods.” Challenges to providing nutritious foods for IYC include

- **Resource-limited women’s extreme time poverty.** The extreme time poverty of resource-limited women across sub-Saharan Africa is well-documented and can be a barrier to producing nutritious meals for IYC as mothers often lack the time to hand-process local ingredients during the complementary feeding stage. For example, grinding dried Kapenta into a fine powder by hand 1) is labor- and time-intensive, 2) entails using a mortar and pestle and repeated sieving to produce a uniformly fine powder, and 3) produces small batches. Therefore, a key attribute of a nutrient-dense protein/micronutrient blend such as ComFA+Fish is that the product is convenient/easy-to-use. This helps ensure that resource-limited women adopt the product long-term and use it on a regular basis when preparing daily meals for IYC. As mothers and CHWs reported, the importance of ease-of-use is further heightened for mothers engaged in income-generating activities conducted beyond the homestead (e.g., market sellers) as they must depend on their older children or nannies for IYC care, and such caregivers often lack sufficient IYC nutrition/feeding knowledge.
- **Need to increase nutrition-based knowledge/skills.** Mothers and CHWs reported an important knowledge gap at the community and household levels on how to prepare nutritious dishes using local ingredients to increase household dietary diversity. For example, although women may have access to numerous local ingredients, many may not know how to prepare dishes using such ingredients and/or their families may have little interest in consuming novel dishes.
- **Food availability is seasonal in rural communities** and, as a consequence, resource-limited households may lack access to or be unable to afford certain nutritious foods during certain seasons. In addition, limited access to a variety of healthy food may be a constant issue for many of the most vulnerable communities and households. As a participant said, “In the valley here, we have a challenge of producing food, so we are stuck with eating *Nshima* [thick maize porridge] and *makowa* [yellow cucumber].”
- **Lake Kariba fishers often sell their entire Kapenta catch at the landing site, which “leaves no fish for the family.”** Men are the primary fishers in Lake Kariba communities, and in their traditional roles as husbands and fathers, they typically exert great decision-making control over household consumption. However, mothers and CHWs reported that, as compared to wives and mothers, husbands and fathers typically have far less knowledge of nutrition in general and of the specific dietary needs of IYC in particular. For example, mothers and CHWs reported that knowledge of Kapenta’s high nutritional value is uncommon among husbands and fathers in their communities. Therefore, husbands and fathers often sell their entire Kapenta catch at the landing site, which “leaves no fish for the family.” Further, mothers and CHWs reported that as the market price of Kapenta has increased, it has become more difficult for resource-limited families to retain a portion of the catch for household consumption.

All eight mothers and CHWs had participated in the Phase II (2022) nutrition/cooking demonstrations and Sensory Panels I-II (see <https://tinyurl.com/n77x8kwj>). During Phase III, they were asked which ComFA+Fish recipes they had prepared for their households. As

Table 1. ComFA+Fish recipes from Phase II that mothers/CHW reported preparing for their households (N=8)

Recipe	Prepared at least once	Continued to prepare
1. ComFA+Fish Complementary Maize Porridge	8	8
2. ComFA+Fish Chibwabwa Fisashi	8	8
3. ComFA+Fish Kapenta Chutney	8	8
4. ComFA+Fish Bean-Vegetable Soup	1	1

Table 1 indicates, all respondents prepared three of the four ComFA+Fish recipes at least once and continued to prepare these three recipes for their households. Some recipe ingredients were substituted due to local availability, taste preferences, and/or allergies. For example, the mothers and CHWs noted that Tilapia could be substituted for Kapenta, spinach or another fresh or dried dark green leafy vegetable could be substituted for fresh or dried pumpkin leaves, peanut butter could be substituted for oil, and the garlic powder or curry powder could be omitted.

NUTRITION PRIORITIES: GOVERNMENT OFFICIALS

Government officials listed the following as the most pressing nutrition-related challenges in Zambia:

- **Inadequate equipment in health centers.** For example, IYC weight scales often break and must be replaced.
- **Lack of linkages between community programs and government-led health initiatives.** They reported a need for more holistic approaches that better link national health initiatives to community programs.
- **Lack of nutrition data to identify early signs of severe malnutrition.** They noted that this is a critical issue given that, “By the time a young child is visibly sick, it may be too late to act.”
- **Need to build upon key government programs to continue to address severe IYC malnutrition nationwide.** They reported that ready-to-use therapeutic foods (RUTF), which are globally produced following strict guidelines to treat wasting in children under 5 years old, are a key government program to address severe malnutrition nationwide. These programs focus on training CHWs, promoting community-based programs to improve IYC and adolescent nutrition, and early identification and timely referral of malnutrition cases to local health care facilities. They mentioned that other projects could easily build on existing government infrastructure to promote better health/nutritional outcomes for IYC. For example, the government has CHW and outpatient community referrals, and as IYC are measured and weighed regularly, borderline and at-risk IYC are identified and targeted with treatment or malnutrition prevention programs.
- **There is a deficit in fish production, and the fish are primarily marketed outside the community.** Very little fish is consumed within the local communities that produce the fish due to high demand in urban centers: “Higher production does not result in higher fish consumption in the villages where the fish is produced, as producers care more about the money from selling fish rather than consuming the fish.”

COMFA+FISH INSTANT PORRIDGES: SCALING READINESS RESULTS AMONG MOTHERS AND CHWS

Using the same protocol employed for the Phase II Sensory Panel I (see <https://tinyurl.com/n77x8kwj>), Phase III participants engaged in Sensory Panel III to evaluate ComFA+Fish Plain Instant Porridge (N=40) and ComFA+Fish Vanilla Instant Porridge (N=38). Both ComFA+Fish instant porridges were evaluated as highly acceptable (see <https://tinyurl.com/2sejjudx>). When mothers and CHWs were asked to discuss ComFA+Fish instant porridges in terms of scaling readiness, they reported several key attributes that ensured that ComFA+Fish instant porridges are scalable, including

- ComFA+Fish instant porridges are nutrient-dense foods suitable for IYC and other household members, and as they only require hot water, they can be prepared by older siblings, nannies, fathers, etc.
- ComFA+Fish instant porridges align with governmental efforts to promote good health for all and related goals. Integrating ComFA+Fish instant porridges into current government programs could assist with nutritional outcomes that contribute to 1) educational attainment among food-insecure children through school feeding programs; 2) achieving zero maternal deaths by improving nutritional and birth outcomes among food-insecure pregnant women; and 3) reducing deaths through improved nutrition among food-insecure HIV+ persons.

Mothers and CHWs highlighted a number of considerations to be addressed for successful scalability, including

- Production of ComFA+Fish instant porridge needs to be supported through agricultural and fisheries interventions to ensure local availability of Kapenta, *mabuyu* (baobab fruit), and other local ingredients.
- ComFA+Fish instant porridges should come in different flavors to appeal to IYC’s taste preferences.
- In addition to IYC, ComFA+Fish instant porridges should target adolescents, pregnant women, elders, etc.

Mothers and CHWs identified the following outcomes as relevant to scaling ComFA+Fish instant porridges:

- Reductions in malnutrition, improved health, and more rapid recovery from illness among IYC, pregnant and breastfeeding women, and the entire household.
- Increased number of children attending school, as ComFA+Fish instant porridges could attract food-insecure children to schools that have school feeding programs.

- Help resource-limited mothers deal with time poverty, as ComFA+Fish instant porridges provide quick and convenient ways to prepare nutrient-dense porridge for IYC and for other household members.
- Producing and/or marketing ComFA+Fish instant porridges can increase incomes for local entrepreneurs.

Venues for scaling ComFA+Fish instant porridges identified by mothers and CHWs included community markets, local health clinics, hospitals/health care facilities, school feeding programs, and national shows and fairs. They discussed the need to invest in technologies to process other locally available nutrient-dense foods (e.g., baobab fruit, tamarind). They recommended attractive packaging and investment in other product promotion strategies. They reported that sensitization/training on the benefits of new food products such as ComFA+Fish instant porridges is vital to ensure community-level adoption. They advised that this sensitization/training must not only engage mothers/caregivers but other important community-level stakeholders and gatekeepers, including husbands and fathers, local chiefs, village headmen and headwomen, traditional healers (e.g., sangomas), and CHWs. They stated that a failure to sensitize/train a broad spectrum of important community-level stakeholders and gatekeepers could negatively impact scaling if, for example, rumors begin to circulate in a community that the new food product includes ingredients that could reduce fertility. They noted that stakeholders/gatekeepers who should be engaged in the scaling process include local-level actors as well as actors at the national and regional levels.

- **Actors at the national level:** Ministry of Health, Ministry of Agriculture/Department of Fisheries and Livestock, Ministry of Education, Ministry of Community Development, Ministry of Small and Medium Enterprise Development (MSMED, which includes the Citizens Economic Empowerment Commission [CEEC]), Ministry of Technology, and other ministries. They also include nongovernmental organizations, the donor community, and development partners such as USAID, Development Aid from People to People in Zambia (DAPP), World Vision, WorldFish, Adventist Development and Relief Agency (ADRA Zambia), and private-sector actors and media at the national level.
- **Actors at regional and local levels:** Trusted community members (particularly mothers and CHWs), local community gatekeepers (local chiefs, headmen, headwomen), traditional healers, farmer-based organizations (FBOs), village savings and loan associations (VSLAs), local councils that manage constituency development funds (CDF), and private-sector actors and media at regional and local levels.

Suggestions from mothers and CHWs for scaling ComFA+Fish instant porridges included

- **Marketing and packaging ComFA+Fish instant porridges in small sachets** to ensure that it is affordable for resource-limited households. Later in this brief, their point is illustrated by a Siavonga entrepreneur/business owner who explained in detail how she repackages bulk foods/products into small sachets to ensure that these foods/products are affordable for resource-limited households.
- **Disseminate nutritional information—including the benefits of ComFA+Fish instant porridges—to diverse audiences (e.g., mothers, fathers, adolescents) to have broader and more lasting impacts.** First and foremost, mothers and CHWs noted that there is an unmet need to develop nutrition information packets and recipe booklets that use local languages (e.g., Bemba, Nyanja, Tonga, etc.) to increase capacity development and nutritional awareness among mothers and CHWs as well as other stakeholders/gatekeepers, particularly fathers. This is because fathers typically have decision-making control over household food consumption, including whether their entire Kapenta catch is sold or some portion of the catch is consumed by the household.
- **Targeting traditional ceremonies, events, and festivals** in different districts may be an effective way to disseminate nutritional information to broader audiences. For example, in southern Zambia, local communities gather at the chief's palace during the annual *Bagande Luindi/Lwiindi* ceremony to celebrate the harvest. Nutritional outreach trainings/capacity development could leverage important events such as this traditional ceremony that draw large crowds. **Churches** could be venues to target women and men with nutritional messages, as some churches already host monthly meetings for women to discuss health topics. Such meetings could be expanded to include IYC nutrition messages, including the nutritional benefits of dried fish powder. Monthly “pastor fellowships” (where ministers from different churches meet)

could be an entry point for targeting women, men, and youth groups with nutrition messages. Likewise, developing nutrition-focused **radio programs** to be aired on Kariba FM, etc., could broaden impact.

- **Nutrition outreach targeting pregnant/parenting adolescents** is needed as they often present at health clinics as malnourished/anemic and their infants are at risk for low birth weight. Nutrition information packets targeting this group should be available during their antenatal and postnatal check-ups to encourage consumption of pelagic small fish and other nutrient-dense foods. Equally important, they noted a need for campaigns to promote the reproductive rights of adolescent girls to reduce adolescent pregnancy.
- Investments in training and start-up capital should 1) specifically target women as farmers, fishers/gleaners, and aquaculturists to increase women's economic empowerment, and 2) increase women's capacity in terms of food safety/preservation to protect the nutritional content of harvested foods.
- They noted a need to have regular "nutrition talks" to keep communities informed. Such events should also target husbands as they exercise great authority over household food consumption yet often lack the same level of nutrition knowledge as their wives. They noted a need for **behaviour change campaigns targeting fisherfolk** to encourage fishers to retain some of their fish catch for household consumption.



Keagan Kakwasha (standing) leads the Scaling Readiness Exercise with entrepreneurs and government officials. *Photo: K. Ragsdale, Mississippi State University*

COMFA+FISH INSTANT PORRIDGES: SCALING READINESS RESULTS AMONG ENTREPRENEURS AND GOVERNMENT OFFICIALS

Three of the five entrepreneurs/business owners had participated in the Phase II (2022) nutrition/cooking demonstrations. During Phase III, these mid-level entrepreneurs were asked which of the four ComFA+Fish recipes showcased during Phase II (see Table 1) they had produced. One entrepreneur produced a dried fish powder-based porridge for mothers and IYC attending the "Under Five Clinic" at the Shimatika Health Post and reported that the mothers enjoyed the porridge. Another entrepreneur reported that she produces dried fish powder for her grandchildren (who live in a distant city), as they like foods fortified with this powder. Concerns to related to scaling ComFA+Fish products among mid-level entrepreneurs included

- Entrepreneurs were not sure that people in rural communities could afford ComFA+Fish products. However, as a Siavonga entrepreneur explained, "At the market, I repackage cooking oil into little sachets, and do the same with sugar and mealie meal. When I sell sachets of cooking oil, I make the same profit margin as when I sell the big bottles, but the sachets are bought-up faster than the big bottles. We even repackage washing powder like *Boom* [a national brand]. We sell a *Pamela* [a maize meal sachet] for 5 Kwacha [0.27 USD]. Profit is more in smaller packages."
- Restaurateurs were unsure that customers would like ComFA+Fish-fortified dishes or could afford them, as the cost of Kapenta has increased over time. Other entrepreneurs reported that their communities lacked some key ComFA+Fish ingredients: "In Sinazongwe, we have a challenge with growing pumpkin leaves and sweet potato leaves, as they tend to be difficult to grow in our area due to drought."
- Lack of mechanized grinding equipment is an important barrier to scaling ComFA+Fish products among mid-level entrepreneurs.
- Scaling ComFA+Fish products can entail switching businesses, which can be challenging and expensive if a businessperson must invest in new equipment.
- It is not easy for small- and medium-sized enterprises to introduce new products, as large investments in market research are needed. In contrast, "Large producers like TradeKing can do market research and tailor campaigns when they are introducing a new product."

Entrepreneurs and government officials supported scaling ComFA+Fish instant porridges, as follows:

- They liked that ComFA+Fish uses locally available, nutrient-dense ingredients and noted that as these products use dried fish powder as a primary ingredient, they can help provide nutritious food during drought: “When staple food production—like maize production—goes down, this [ComFA+Fish] can help with issues of climate change. We [live] in the valley, and the rain pattern is poor. So, in the event that farmers have not produced much maize, this innovation can improve nutritional availability.”
- They noted that, as preparing ComFA+Fish instant porridges only requires hot water, this could reduce mothers’ time burden associated with daily preparation of complementary foods. For this same reason, “It can be prepared by both men and women. This instant porridge makes it easier for men to prepare food for children and, God willing, [men] may just end up feeding the baby.”
- They reported that global supply chain disruptions during the COVID-19 pandemic led to shortages at Zambian health facilities of imported RUTF to treat IYC wasting. They noted that a locally sourced, nutrient-dense product such as ComFA+Fish could help prevent malnutrition and reduce the need for RUTF.

Venues for scaling ComFA+Fish suggested by entrepreneurs and government officials included

- **School feeding programs:** “If it [ComFA+Fish] can be produced in large quantities, it can be used in schools under the school feeding programs in Gwembe, Siavonga and Sinazongwe, where the diets now include *magwaza* [plain boiled maize], soy porridge, and Nshima with beans.”
- **Outpatients:** Health officials advised that ComFA+Fish could work well for convalescing outpatients, but rigorous nutritional evaluations are needed before ComFA+Fish could be recommended for inpatients.

Entrepreneurs and government officials noted the following as key complementary innovations needed to scale dried fish powder, ComFA+Fish instant porridges, and other ComFA+Fish products related to production costs and marketing costs:

- **Production costs:** The cost of mechanized grinders (including solar models) should be “set at a fair price” and exempted from import tax. Affordable mechanized grinders help reduce labor costs as “pounding fish requires a workforce if you don’t have a motorized machine.” Securing a space to process dried fish into powder in volume will need to be factored into the production costs, as will packaging materials.
- **Marketing costs:** Branding/advertising will need to be factored into marketing costs.

According to entrepreneurs and government officials, ComFA+Fish scaling outcomes could impact 1) nutritional and cognitive development among at-risk IYC, 2) educational outcomes for children with access to school feeding programs, 3) income-generation among community- and mid-level entrepreneurs, and 4) consumption of pelagic small fish, particularly in fishing communities with low fish consumption. High-level development outcomes could include

- UN goals to end hunger through provision of micronutrients could be further advanced through increased consumption of pelagic small fish among at-risk IYC.
- Employment creation as entrepreneurs/business owners will benefit from expanded income-generating opportunities and government will benefit from an expanded tax base.
- Local cooperatives could access constituency development funds (CDF) to fund business ideas related to pelagic small fish value chains.
- Health officials noted that promoting dried fish powder and ComFA+Fish products to address malnutrition could capitalize on existing governmental programs to improve maternal and child health.

Challenges to scaling ComFA+Fish instant porridges noted by entrepreneurs and government officials included

- Raw materials are expensive and supply chains may be subject to disruptions: Lake Kariba’s regular fishing ban allows the pelagic small fish population to recover, but reduces the supply and drives up prices.
- Lack of appropriate machinery to process dried Kapenta into powder can impact quality and shelf life.
- End consumers may reject new food products due to unfamiliarity and/or lack of trust, or think they need to consume a lot of Kapenta for nutritional benefits.
- When introducing a new product, small businesses may not have enough funds to market the product.

Entrepreneurs and government officials identified the following key stakeholders who could be engaged in scaling up ComFA+Fish instant porridges:

- Department of Fisheries and Livestock (experts in regulating local fish supply chains), Ministry of Community Development and Social Services, Ministry of Education (school feeding), Ministry of Health, National Food and Nutrition Commission of Zambia (school feeding), World Food Programme, others.
- Kariba Harvest, Mbikaze Restaurant, Yalelo, Zamfresh, fishers associations, fish farmer cooperatives.
- Local municipal councils, local government for funding via CDF and/or the Citizens Economic Empowerment Commission (CEEC).
- **Community Health Workers (CHWs)** such as Sinazongwe-based Betty Muleya, a ComFA+Fish champion featured in Agrilinks (see <https://tinyurl.com/3a42yf8e>), are vital to scaling because 1) they are important and trusted community-based health actors vital to mobilizing communities around nutrition and health; 2) new foods like ComFA+Fish can be rejected if community members believe that they can reduce fertility, etc., and CHWs can help allay such misconceptions; 3) community members are more likely to adopt ComFA+Fish products recommended by CHWs.
- **Traditional healers** are vital to scaling because 1) they are important and trusted community-based health actors; 2) new foods like ComFA+Fish can be rejected if community members believe that they can reduce fertility, etc., and traditional healers can help allay such misconceptions; and 3) community members are more likely to adopt ComFA+Fish products recommended by traditional healers.

Suggestions from entrepreneurs and government officials for scaling ComFA+Fish instant porridges included

- Appropriate machinery to process and preserve Kapenta when it is abundant for use when it is scarce.
- Product acceptability: As ComFA+Fish is a new product, it requires advertising and sensitization.
- School feeding programs can support the successful scaling of ComFA+Fish instant porridges.
- Existing CDF-supported community-based cooperatives could support scaling through access to funding to purchase the food-grade machinery, raw materials, etc., to produce ComFA+Fish products and receive training on its production. Capitalizing on CDF decentralization efforts, community-based start-ups could form cooperatives to produce and sell ComFA+Fish products.
- The Ministry of Health could support CHWs in awareness raising to promote consumption of dried fish powder and ComFA+Fish instant porridges.
- Existing food producers and private sector start-ups can produce ComFA+Fish instant porridges.
- Traditional healers, who are often trusted community gatekeepers, should participate in sensitization to help remove misconceptions/barriers that can hinder adoption of ComFA+Fish instant porridges.
- Schools and nursery schools could be targeted with information, as well as promotions during annual national holidays such as International Women's Day (commemorated annually on March 8) and International Youth Day (commemorated annually on March 12).

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ABOUT THE FISH INNOVATION LAB

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www.fishinnovationlab.msstate.edu

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