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Stakeholder Analysis and Environment Scanning Report

**FishFirst! Zambia Research for Development
and Scaling up staple-Fish Products for
Enhanced Nutrition in the First 1,000 Days of
Life.**

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WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific, WorldFish is a member of CGIAR, the world's largest global partnership on agriculture research and innovation for a food secure future.

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List of Acronyms

ASF	Animal source foods
ComFA+	Complementary Food for Africa + dried fish powder
EPA	eicosapentaenoic acid
DHA	docosahexaenoic acid
FPP	Fish protein powder
MSU	Mississippi State University
WRA	Women of Reproductive Age
IYC	Infant and Young Child
DGLV	Dark Green Leafy Vegetables
FPP	Fish Protein Powder

1.0 EXECUTIVE SUMMARY

Background: Worldwide, feeding practices for children aged 6–23 months do not meet the global recommendations. To contribute towards adequate nutrition for Infants and Young Children, WorldFish, and Mississippi State University (MSU), are implementing the "FishFirst! Zambia: Research for Development and Scaling Staple- Fish Products for Enhanced Nutrition in the First 1,000 Days of Life" project. This research activity aimed to conduct a multi-stakeholder and environmental scan review to identify nutrient-dense, locally sourced staple foods in powder form to combine with dried fish powder to create the ComFA+Fortified foods.

Methodology: This study was conducted in Kambimbi fishing camp in Siavonga. In this research, an inductive approach known as grounded theory was employed to investigate the individual and social processes related to ComFA+Foods. A purposive sample of 12 women and three men was selected to participate in Focus Group Discussion (FGD) from Kambimbi Fishing Camp. Information about the study was provided to the participants before the beginning of the Focus group discussions. Men and women who were willing to participate then gave consent. An FGD with a question guide was used to collect data. Notes were also taken during the FGD. The data was collected by WorldFish for the FishFirst Zambia Project. The data was then analyzed manually based on the emerging thematic areas in the data set. The data were organized according to the WHO Dietary Diversity guidelines for Infants and Young Children (WHO DD-IYC). DD-IYC is the percentage of children aged 6-23 months who receive a minimum dietary diversity. Dietary diversity is present when the diet contains five or more of the following food groups: breast milk; grains, roots and tubers; legumes and nuts; dairy products (milk, yoghurt, cheese); flesh foods (meat, fish, poultry, liver or other organs); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

Results: ComFA+Staple foods from four food groups based on the WHO's DD-IYC were reported to be produced in Siavonga. These groups are cereals, roots, tubers and plantains; pulses, nuts and seeds; flesh foods; and vitamin A-rich fruits and vegetables. Vitamin A-rich fruits and vegetables is the group to which dark green leafy vegetables (DGLV) belong. Among the specific ComFA+Staple foods, except cassava, cassava leaves, fish and rape that are produced throughout the year, the rest are only grown in the rainy season. The five leading ComFA+ Staple foods contributors to total production in the area include; flesh foods, namely; fish breams and fish-kapenta, as well as a cereal- maize. Others are; a tuber known as sweet potato and vitamin A-rich pumpkins, as well as flesh foods known as other fish species. Among the flesh foods, fresh, sundried and smoked fish produced at the fishing camp are sold at wholesale and retail outlets.

On the other hand, fresh rape (kale) produced among the DGLVs is only sold at retail outlets. In Siavonga, maize (a cereal) and a flesh food fish breams contribute 100% to the food basket. Following are other flesh foods, namely, other species of fish and fish-kapenta and a tuberous root food group, sweet potatoes. Other ComFA+Staple foods contributing significantly to the food basket are vitamin A rich foods such as pumpkin leaves, rape, and bean leaves in that order.

Women are the main producers of cereals, roots and tubers and pulses, nuts, seeds and vitamin A rich vegetables, which are all (100%) consumed was produced. On the other hand, men are the main producers of flesh foods, particularly fish kapenta, other fish species and fish breams which are mainly sold to the local and external markets once produced. The priority staple foods in Siavonga belong to three groups, namely; 1) cereals, roots and tubers; 2) flesh foods; and 3) vitamin A rich foods, also known as dark green fruits and vegetables (DGLV). Specific foods for each group include whole maize and whole sweet potatoes, fish and other small fish species except for Kapenta, fresh rape and fresh and dry

sweet potato leaves, respectively. Maize, sweet potato and cassava, and DGLV ranked highly in foods bought from retail outlets and were at the same level. These are cereals, roots, tubers, and vitamin A-rich foods. The least ranked foods are flesh food particularly beef and chicken and Irish potato, a stem tuber. Households mainly purchase energy-dense foods as well as DGLV. Cereals, roots and tubers, particularly maize meal porridge or nshima (pap) as mashed or fried sweet potatoes when in season, were reported to be offered seven times a week to children. Likewise, flesh foods, particularly fish of all sorts in the form of gravy and a bit of flesh but not fish powder, were offered to infants seven times a week. DGLVs boiled, fried or mixed with groundnut whole or gravy were offered to infants three times per week. Prospects for ComFA+Fortified foods exist because several cooperatives in fish farming and crop growing are reported in Siavonga. In addition, most of the fish in the area is dried and can be turned into powder. A number of entrepreneurs drying and trading in fish were reported to exist. These can pick up the idea of fish powders. Furthermore, solar and electric harmer mills could be exploited to mill all the ComFA+Fortified food powders.

Conclusion: The fact that one of the food groups consumed in Siavonga is flesh foods particularly fish gives the potential for dietary adequacy for children as children consuming fish are less likely to be stunted. Promoting the use of fish powders in ComFA+Fortified foods will lessen incidences of offering broths to children since many of the important nutrients are located in the meat, bones and organs. The fish powder will also fortify the overall energy-dense foods for infants. Engaging the private businesses sector would have an impact.

2.0 INTRODUCTION

2.1 BACKGROUND

Worldwide, most children aged 6–23 months are not fed according to global recommendations explaining why nearly half of all deaths in children aged five years and below are attributed to undernutrition (UNICEF & GSO, 2015). Undernutrition further puts children at greater risk of dying from common infections. It also increases the frequency and severity of such infections and delays recovery (UNICEF & GSO, 2015). To measure feeding practices for children aged 6-23 months, WHO and UNICEF formulated feeding indicators in 2008 and updated them in 2021. One of the Indicators is Egg and/or flesh food consumption, also known as animal source foods (ASF) (UNICEF & GSO, 2015). This group includes fish. This group is important in feeding children aged 6-23 months because plant-based complementary foods have been reported to be insufficient to meet the needs for certain micronutrients. Therefore, it has been recommended that meat, poultry, fish, or eggs be part of the daily diet or eaten as often as possible. Currently, eggs and/or flesh consumption for children 6-23 months in the world is at 45% (UNICEF, 2021). In Zambia meat, fish, and poultry together are consumed by 40% of breastfeeding children and are at 47% among non-breastfeeding children. Low consumption of ASF may be contributing to stunting levels among under-five children in Zambia, which are currently at 35% (CSO, 2018).

In order to contribute towards adequate nutrition for Infants and Young Children, WorldFish in collaboration with Mississippi State University (MSU) is implementing the "FishFirst! Zambia: Research for Development and Scaling Staple-Fish Products for Enhanced Nutrition in the First 1,000 Days of Life" project. This project aims to increase the quality and quantity of fish benefitting nutrition and food security in Zambia, especially for women of reproductive age (WRA; ages 15-49 years) and children in the first 1,000 days of life (< 2 years). Fish and other aquatic foods grown in and harvested from oceans, lakes, rivers and ponds provide income for people. In addition, they represent an important component of the human diet, providing about 3.1 billion people with almost 20 percent of their average daily animal protein intake (Joordens et al., 2014). They also provide the only readily available dietary source of long-chain omega-3 polyunsaturated fatty acids for direct human consumption (including eicosapentaenoic acid or EPA and docosahexaenoic acid or DHA (Sargentl & Tacon, 1999, Joordens et al., 2014, Tacon & Metian, 2017). ComFA+Fortified foods can be formulated by combining locally available staple foods with fish powders of

locally produced fish to improve on nutrient density of the food for Infants and Young Children.

2.2 NUTRIENT DENSITY OF COMFA+FORTIFIED FOODS FOR CHILDREN AGED 6-23 MONTHS

Families could ensure the nutrient density of ComFA+Fortified foods by combining staple food powders from various nutrient-dense foods. Combining nutrient-dense foods could be based on the dietary diversity indicator for infants and young children (DD-IYC). This indicator is made up of 8 food groups namely; Cereals, roots, tubers and plantains, flesh foods, eggs, milk and vitamin A rich foods. Others are legumes, pulses and nuts. The last two groups are other fruits and vegetables as well as Breast milk (Bhandari & Chowdhury, 2016). Therefore, in addition to breast milk, at least three of these food groups should be used in combination with Kapenta powders for infant feeding. Elsewhere, over 50% of mother-child pairs have been reported to have failed to meet the minimum recommended dietary diversity, and while fish was the main animal-source food in diets, the introduction of fish to infant and young child diets was delayed due to fears of allergies and illnesses. Access to nutrient-dense foods was affected by variable and insufficient income from fisheries-based livelihoods, isolation from markets, and the broader food environment (Gibson et al., 2020).

2.3 GENDER ISSUES

The fishing sector is marred with gender-based barriers to participation. Men dominate fishing. Women lack the bargaining power to access fish. Access to fish is determined mainly by financial capital, the level of fish catches, and social capital, including complex relations with each other and fishermen (Matsue et al., 2014). Staple crops and fish are predominant in fishing camps. In addition, crops produced for home consumption or subsistence crops in fishing camps, like in many other settings, are perceived as women's crops (Doss, 2002). This state of affairs could affect the availability of fish in adequate quantities for family meals.

2.4 OPPORTUNITIES FOR COMFA+FORTIFIED FOODS

Lessons could be drawn from FedWell Foods working alongside WorldFish. FedWell Foods provided the expertise to explore the opportunities and to develop the initiative to suit the needs and tastes of the Myanmar market (FedwellFoods, 2016). Fedwell Foods produces and sells nutritious food products, such as Alpha-nutri soup and Alpha protein soups. Through partnerships with NGOs, charity organizations and retailers, the products reach poor and vulnerable groups, including internally displaced people, disaster-stricken families and orphans (FedwellFoods, 2016). The private sector in Zambia could emulate FedWell

Foods. The Fedwell model could make fish powders available on the market for feeding mothers, their children and the whole household.

The purpose of this study was to conduct a multi-stakeholder and environmental scan review to identify nutrient-dense, locally sourced staple foods in powder form to combine with dried fish powder to create the ComFA+Fortified foods.

3.0 METHODOLOGY

3.1 SETTING

This study was conducted in Kambimbi fishing camp in Siavonga. Siavonga is a town in the Southern Province of Zambia, lying on the north shore of Lake Kariba. It is Zambia's principal tourism centre for the lake, with accommodation, boating and fishing tours on offer (WHO, 2022).

3.2 STUDY DESIGN

In this research, an inductive approach known as grounded theory was employed to investigate the individual and social processes related to ComFA+Foods. Grounded theory involves construction of theory through data analysis to feed into upcoming research agenda (Phiri et al., 2013).

3.3 SAMPLING

A purposive sample was selected to participate in Focus Group Discussion (FGD) from Kambimbi Fishing Camp. This sample was composed of 12 women and three men.

3.4 DATA COLLECTION

Information about the study was provided to the participants before the beginning of the Focus group discussions. Men and women who were willing to participate then gave consent. An FGD with a question guide was used to collect data. Notes were also taken during the FGD. The data was collected by WorldFish for the FishFirst Zambia Project.

3.5 DATA ANALYSIS

The data were organized according to the WHO Dietary Diversity guidelines for Infants and Young Children (WHO DD-IYC). This indicator describes the percentage of children aged 6-23 months who receive a minimum dietary diversity. Dietary diversity is present when the diet contains five or more of the following food groups: breast milk; grains, roots and tubers; legumes and nuts; dairy products (milk, yoghurt, cheese); flesh foods (meat, fish, poultry, liver or other organs); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables (Kennedy et al., 2010). It was then analyzed manually based on the emerging thematic areas in the data set.

4.0. FINDINGS AND DISCUSSION

4.1 CHARACTERIZATION OF STUDY SUBJECTS

The FGD consisted of 12 women and three men from Kambimbi fishing camp in Siavonga.

4.2 FARMING IN SIAVONGA

It was reported that there is not much farming in the area, mainly due to poor soils and low rainfall. The region belongs to Zone 1 of Zambia's three main agro-ecological zones. This zone covers the country's major valleys with 23% of the country's total land surface area. The harshest climatic conditions are found in this zone, with low rainfall of less than 800 mm per annum and a short growing season of between 80–120 days. It has a medium to high risk of drought (WHO and UNICEF, 2021). In Siavonga, although there were opportunities to farm, most people were reported to opt for fishing paying no much attention to farming.

4.3 FOOD GROUPS COVERED BY FOOD PRODUCED

Table 1 shows ComFA+Staple foods from four food groups based on the WHO's Dietary Diversity guidelines for Infants and Young Children (DD-IYC). Foods reported to be produced in Siavonga belong to the four food groups. These groups are 1) cereals, roots, tubers and plantains; 2) pulses, nuts and seeds; 3) flesh foods as well as 4) vitamin A rich fruits and vegetables, also known as dark green leafy vegetables (DGLV). DD-IYC is a qualitative measure of food consumption that reflects the child's access to a variety of foods and is also a proxy for nutrient adequacy of the diet of individuals (Gerald & Dorothy, 2021). WHO recommends eight food groups from which food for a child aged 6-23 months can be prepared to prevent all forms of malnutrition (Marinda et al., 2018, Funduluka et al., 2022). The food groups include grains, roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A rich fruits and vegetables; other fruits and vegetables as well as breast milk (Marinda et al., 2018, Funduluka et al., 2022). Children aged 6-23 months are supposed to consume foods and beverages from at least five of eight defined food groups during a 24-hour period (Chapoto et al., 2016). Therefore the food groups covered by the food produced in Siavonga may be enough to meet the dietary needs of breastfeeding children aged 6-23 months. The fact that one of the food groups is flesh foods, particularly fish, gives the potential for dietary adequacy for children as children consuming fish are less likely to be stunted (Vargas & Vigneri, 2010).

4.4 COMFA+STAPLE FOODS SEASONALITY

In table 1, among the specific ComFA+Staple foods, except cassava, cassava leaves, fish and rape produced throughout the year, the rest were reported to be only grown in the rainy

season. Their seasonality means that accessibility of the ComFA+Staple seasonal foods could depend on preservation and the area's commercial activities to make them available throughout the year.

Table 1 Production Season for Comfa+Staple Foods

WHO's DD-IYC Food Groups	List of foods	Production season
Cereals, roots, tubers and plantains	Maize	Rain season
	Millet	Rain season
	Cassava	All year
	Sweet potato	Rain season
Pulses nuts and seeds	Beans	Rain season
Dairy products		
Flesh foods	Fish- breams	All year
	Fish-Kapenta	All year
	Fish-other species	All year
Eggs		
Vitamin-A-rich fruits and vegetables	Pumpkins	Rain season
	Pumpkin leaves	Rain Season
	Sweet potato leaves	Rain season
	Cassava leaves	All year
	Bean leaves	Rain season
	Rape/Kale	All year
Other fruits and vegetables		

NB: Rain season is generally from November to March

4.5 PRIORITY COMFA+STAPLE FOODS

The priority staple foods in Siavonga belong to three groups, namely; 1) cereals, roots and tubers; 2) flesh foods; and 3) DGLV. Specific foods for each group include maize and sweet potatoes, fish and other small fish species except for Kapenta and rape and sweet potato leaves, respectively. Maize is consumed fresh, boiled or as nshima and porridge made from milled dry grain. Sweet potatoes are eaten whole, fresh and boiled. Fish is eaten whole, fresh, and sundried or smoked. Meanwhile, DGLV are shredded and eaten fresh or dried.

Shelled dry maize and dry DGLVs were reported to be stored for future consumption. Sacks are used for the storage of dry-shelled maize grains as well as dry DGLVs. In the case of maize, small round structures raised from the ground (chimpaka in vernacular) are used to store grains. Anti-grain borer chemical (chirindamura dust) is added to maize grain to keep it longer. Women were reported to be the main food processors (table 2).

Table 2 Priority Comfa+Staple Foods

WHO's DD-IYC Food Groups	Food	Form in which it is consumed	Form of processing/ value addition	Means of storage
Cereals, roots, tubers and plantains	Maize	Whole grain nshima (pap)	Fresh maize boiled Dry grain boiled Dry grain milled into maize meal for nshima and porridge	In sacks as shelled grain In small round structures – raised from the ground (chimpaka) Anti-grain borer chemical (chirindamura) is added
	Sweet potato	Whole	Fresh	Not stored but eaten when in season
Flesh foods	Fish (Brems and other small species except for kapenta)	Whole	Fresh Sundried Smoked	Not stored for long as it is readily available
Vitamin A rich fruits and vegetables	Rape (kale)	Shredded	Fresh	N/A
	Sweet potato leaves	Shredded	Fresh Dried	In sacks

4.6 PRODUCTION AND UTILIZATION OF COMFA+STAPLE FOODS

The six leading ComFA+ Staple foods contributors to total production in the area reported include; fish brems (80%), fish-kapenta (60%) and maize (40%). Others were; sweet potatoes and pumpkins (20%) and other species of fish (10%). In terms of contribution to the food basket, maize and fish bream were indicated to contribute 100%, followed by other species of fish (90%), fish-kapenta (80%) and Sweet potatoes (70%) were reported. Other

reported ComFA+Staple food with significant contributions to the food basket include; pumpkin leaves (60%), rape (40%) and bean leaves (30%). These foods generally belong to only three groups based on the DD-IYC: flesh foods to which fish belong; cereals, roots and tubers, a group where maize and sweet potatoes belong and vitamin a rich foods where pumpkins and DGLVs belong. This state of affairs gives children 6-23 months of age a chance to consume from at least four food groups, including breastfeeding per day. The leading contribution of fish, a nutritious flesh food to total production and food basket, gives hope for children to thrive as the availability and quantity of fish consumed by children are significantly associated with stunting (Vargas & Vigneri, 2010). It is also worth noting that apart from fishing, maize being the national staple food in Zambia (Me-Nsope & Larkins, 2016) is one crop that households in Siavonga were reported to make an effort to farm. Households also continue buying maize or maize meal at all costs as it is the main starch consumed at least twice daily. Thus maize, particularly maize meal, is the main base food for ComFA+fortified foods.

4.7 UTILIZATION OF COMFA+STAPLE FOODS

All the cereals, roots and tubers and pulses, nuts seed and DGLV produced were reported to be consumed by households. While sweet potatoes and pumpkins are not grown that much, they were cheaply available on the market soon after the rainy season and could be preserved and be available all year round. DGLV were grown at a low scale but prevalent in the rainy season. Because of the abundance of DGLV during the rainy season, there is plenty of potential to preserve them so they could be available all year round. In terms of flesh foods, only 30% of fish breams produced were consumed by households, followed by other species of fish (20%) and fish kapenta (10%). Most of the fish-kapenta produced is sold (table 3).

Table 3 Production & Utilization of Comfa+Staple Foods

WHO's DD-IYC Food Groups	List of foods	% contribution to total production/harvest	% contribution to food basket	Utilization	
				Consumption (%)	Sale (%)
Cereals, roots, tubers and plantains	Maize	40	100	100	0
	Millet	5	5	100	0
	Cassava	5	5	100	0
	Sweet potato	20	50	100	0

Pulses nuts and seeds	Beans	5	30	100	0
Dairy products					
Flesh foods	Fish- breams	80	100	30	70
	Fish-Kapenta	60	80	10	90
	Fish-other species	10	90	20	80
Eggs					
Vitamin-A	Pumpkins	20	50	100	0
Other fruits and vegetables	Pumpkin leaves	0	60	100	0
	Sweet potato leaves	0	70	100	0
	Cassava leaves	0	5	100	0
	Bean leaves	0	30	100	0
	Rape/Kale	0	40	100	0
Other fruits and vegetables					

4.8 PRODUCERS OF COMFA+STAPLE FOODS AND MARKET AVENUES

Table 4 shows that women were the primary producers of cereals, roots and tubers, pulses, nuts, seeds and DGLV. These foods were reported to be all (100%) consumed in households. Women were also the main producers or solicitors of fresh rape (kale), a DGLV sold at local retail outlets in small quantities. Table 4 also demonstrates that men were the main producers or solicitors of flesh foods, particularly kapenta, breams and other fish species. Once produced, large quantities of the fish are sold retail or wholesale to the local and external markets. Elsewhere men were reported to tend to control farm products that enter the market economy and become profitable than women (Abbey et al., 2016).

Table 4 Producers of Comfa+Staple Foods

WHO's DD-IYC Food Groups	List of foods	Main cultivators/solicitors	Market Avenues/form in which sold (unprocessed or processed)
Cereals, roots, tubers and plantains	Maize	Women	Local very small insignificant quantities
	Millet	Women	
	Cassava	Women	
	Sweet potato	Women	
Pulses nuts and seeds	Beans	Women	Local very small insignificant quantities
Dairy products			
Flesh foods	Fish- breams	Men	Local and External Retail and wholesale Fresh, sundried, smoked
	Fish-Kapenta	Men	
	Fish-other species	Men	
Eggs			
Vitamin A rich fruits and vegetables	Pumpkins	Women	Local very Small Insignificant quantities Retail raw
	Pumpkin leaves	Women	
	Sweet potato leaves	Women	
	Cassava leaves	Women	
	Bean leaves	Women	
	Rape/Kale	Women	
Other fruits and vegetables			

Local: Within the community around Siavonga; external: anywhere outside Siavonga

4.9 RAW FOOD COMMONLY BOUGHT FROM RETAIL OUTLETS IN SIAVONGA

Cereals, mainly maize, sweet potatoes and cassava, classified as roots and tubers and DGLV were ranked highly and at the same level in terms of importance and preference when purchasing. The least-ranked foods are flesh foods, particularly beef and chicken and Irish potatoes, a stem tuber (figure 1). Maize dominates Zambia's food consumption, providing over half of all calories consumed. Cassava is the second most important food staple nationally; in some regions, it is the preferred staple (Cartmill et al., 2022). Sweet potatoes

also play an important role in both urban and rural Zambia when in season. Types of foods bought from retail outlets were later linked to foods fed to infants: maize, sweet potatoes when in season, fish gravy and whole or gravy of DGLV (table 5). ComFA+Fish powder could improve the nutrient density of mainly energy-dense foods and reduce hidden hunger. (Abbey et al., 2016)

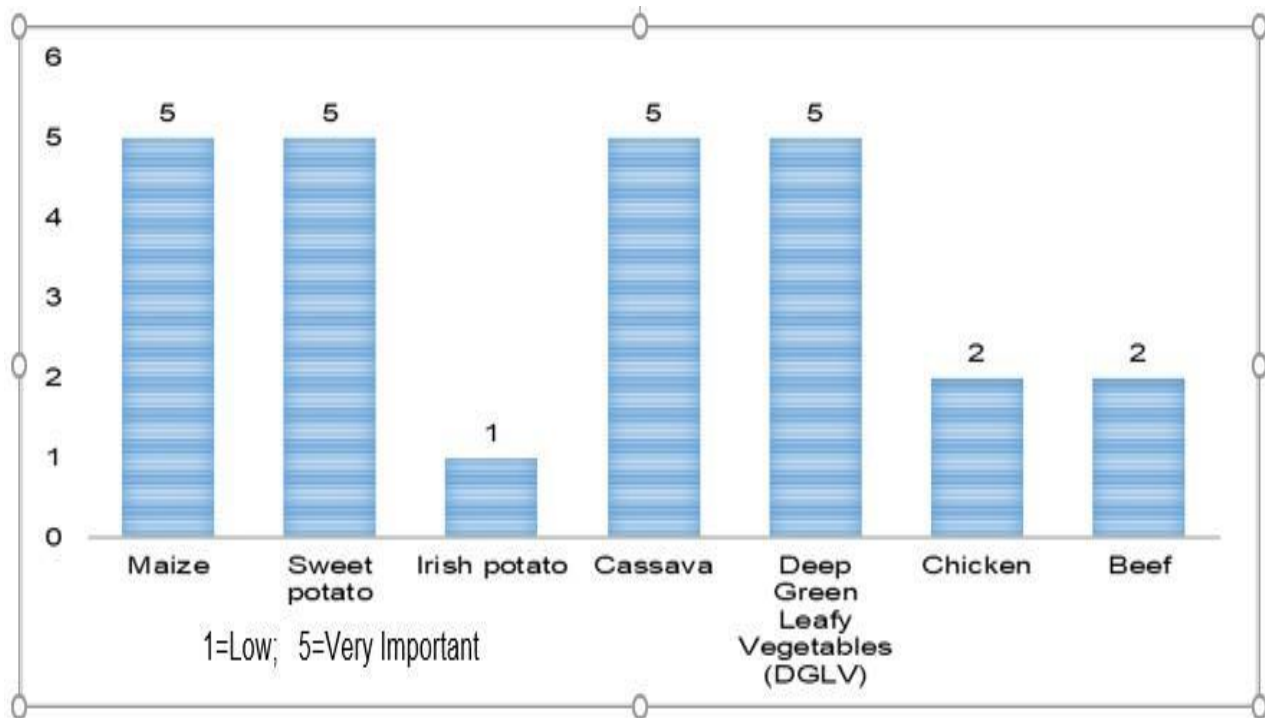


Figure 1 Ranking of Raw Food Bought From Retail Outlets

4.10 FOOD ITEMS FED TO INFANTS

The most frequent food groups fed to infants were cereals, roots and tubers. These were reported to be offered to infants seven times a week. Maize meal porridge, nshima (pap), and mashed or fried sweet potatoes were common foods. Likewise, flesh foods, particularly fish of all sorts in the form of gravy and a bit of flesh, were offered to infants seven times a week. Fish powders were not produced.

“...we don’t produce any fish powders, but we know about fish powders since we were ...trained on how to make and use the powders; especially for porridge for babies. Some people from government came and taught us about two years ago.”

(Respondent from Kambimbi fishing camp)

Notably, DGLVs boiled, fried or mixed with groundnuts were offered whole or as gravy to infants three times per week (table 5). In Kenya, in a similar environment, most caregivers reported feeding porridge made from maize, millet or cassava flour as their first foods. Half of the caregivers began including fish when the child reached one year old, and those who

introduced fish between six and eleven months served it in the form of a soup or broth, not including the fish's flesh, organs or bones²⁵. This practice reduces the full benefits of feeding fish, as many important nutrients are located in the meat, bones and organs (Cartmill, M. K. et al., 2022).

Table 5 Food Items Fed To Infants

WHO's DD-IYC Food Groups	Food	Mode in which consumed	Mode of preparation	Frequency of consumption per week (average)
Cereals, roots, tubers and plantains	Maize	Porridge Nshima/pap Whole maize grain (soft)	Boiling Cooked	7
	Sweet potato	Mashed Fries	Boiling Frying	7 (if in season) 0 (when out of season)
	Irish Potato	Mashed Fries	Boiling Frying	1
	Cassava	Mashed	Boiling	1
Flesh foods	Fish (All sorts)	Bit of flesh Gravy	Boiling Frying Roasted	7
	Chicken	Flesh Gravy	Boiling Frying	1
	Beef	Flesh Gravy	Boiling Frying	1
Vitamin A rich fruits and vegetables	DGLV	Whole Gravy	Boiling Frying Mixed with groundnut powder (ifisashi)	3

Note: 0=none, 1=rare to 7= very high such as every day

4.11 OPPORTUNITIES FOR COMFA+FORTIFIED FOODS

A validation exercise with government officials at the Pub and Grill revealed that several cooperatives in fish farming and crop growing exist in Gwembe, Siavonga and Sinazongwe. Most of the fish was dried and could be turned into powder. There were also several entrepreneurs drying and trading in fish who could pick up the idea of fish powders. Lessons could be drawn from FedWell Foods, which started in Myanmar in 2012, producing and selling nutritious food products (FedwellFoods, 2016). The products include; Alpha-nutri soup and Alpha protein soups. The company formed partnerships with NGOs, charity organizations and retailers¹². The products reach poor and vulnerable groups, including internally displaced people, disaster-stricken families and orphans (FedwellFoods, 2016). FedWell Foods sees adding dried small fish powder to products as an opportunity to increase their nutritional value substantially. Working alongside WorldFish, the company provided the expertise to explore the options and to develop the initiative to suit the needs and tastes of the Myanmar market (FedwellFoods, 2016). Possible equipment for making ComFA+Fortified food powders include; solar and electric harmer mills existing in communities. Meanwhile, Siavonga places along the bottom road without access to the lake also have the potential to buy fish powders after teaching them.

5.0 CONCLUSION

The six leading ComFA+ Staple foods contributors to total production in the area include; flesh foods, namely; fish breams and fish-kapenta and a cereal (maize). Others are; a tuber known as sweet potato and vitamin A rich pumpkins, and flesh foods, especially as other fish species. Among the flesh foods, fresh fish, sundried and smoked produced, most are sold at wholesale and retail outlets. Fresh rape (kale) produced among the DGLVs is sold at retail outlets. In Siavonga, a cereal (maize) together with a flesh food fish (breams) contribute 100% to the food basket. These are followed by other flesh foods, namely, other species of fish and fish-kapenta and a tuberous root food group sweet potatoes. Other ComFA+Staple foods with significant contributions to the food basket are vitamin A rich foods, which are; pumpkin leaves, rape and bean leaves in that order.

The priority staple foods in Siavonga belong to three groups, namely; 1) cereals, roots and tubers; 2) flesh foods; and 3) vitamin A rich foods, also known as dark green fruits and vegetables (DGLV). Specific foods for each group include whole maize and whole sweet potatoes, fish and other small species of fish except for Kapenta, fresh rape and fresh and dry sweet potato leaves, respectively. Maize, sweet potato, cassava, and DGLV ranked highly and were bought from retail outlets at the same level. These are categorized as 1) cereals, 2) roots and tubers and 3) Vitamin A rich foods, respectively. The least ranked foods are flesh foods, particularly beef and chicken and Irish potato a stem tuber. Households mainly purchase energy-dense foods and DGLV.

Meanwhile, cereals, roots and tubers, particularly maize meal porridge or nshima (pap) and mashed or fried sweet potatoes, were offered to children seven times a week when in season. Likewise, flesh foods, particularly fish of all sorts in the form of gravy and a bit of flesh but not fish powders, were offered to infants seven times a week. DGLVs boiled, fried or mixed with whole groundnut or gravy were offered to infants three times per week. Thus children's diets were mainly energy-laden, added with fish and vegetable broths.

Women are the main producers of cereals, roots, tubers, pulses, nut seeds and vitamin A rich vegetables. These foods were all (100%) consumed once produced. On the other hand, men are the main producers of flesh foods, particularly all kinds of fish, mostly sold to the local and external market once produced. Opportunities for ComFA+Fortified foods abound as several cooperatives in fish farming and crop growing exist in Siavonga. Most of the fish is dried and can be turned into powder. There were also several entrepreneurs drying and trading in fish who could pick up the idea of fish powders. Meanwhile, many solar and electric harmer mills that meal maize but could also meal other dried nutrient-dense foods are found

in the district. Engaging the private business sector to produce powders and premixes would be impactful in promoting ComFA+Fortified foods.

6.0 RECOMMENDATIONS

The fact that one of the food groups consumed in Siavonga is flesh foods, particularly fish, gives the potential for dietary adequacy for children as children consuming fish are less likely to be stunted. Therefore, promoting fish powders in ComFA+Fortified foods will lessen incidences of offering broths to children since many of the important nutrients are located in the meat, bones and organs. Promoting fish powder will also fortify the heavily energy-dense foods for infants. Meanwhile, engaging the private business sector would be impactful in promoting ComFA+Fortified foods

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8.0 ANNEXES

Fish First Zambia Project
Multi stakeholder analysis (FGD) --staple foods seasonality and utilization (Siavonga)
Name of fishing camp/village: Kamimbi
Collected by: Lizzy Muzungaire

ANNEX 1 PRODUCTION SEASON FOR COMFA+STAPLE FOODS

S/N	Staple food	When it is produced	% contribution to total production /harvest	% contribution to food basket	Utilization		Market of sale (Local/External)	Main cultivator/solicitor			
					Consumption (%)	Sale (%)		Men	Women	Youth	Mixed
1a.	Fish- breams	All year	80	100	30	70	Both	X			
1b.	Fish-Kapenta	All year	60	80	10	90	Both	X			
1c.	Fish-other species	All year	10	90	20	80	L	X			
2.	Maize	Rainy season	40	100	100	0	L (very small insignificant quantities)		X		
3.	Cassava	All year	5	5	100	0	L (very small insignificant quantities)		X		

4.	Sweet potato	Rainy season	20	50	100	0	L (very small insignificant quantities)	X
5.	Pumpkin	Rainy season	20	50	100	0	L (very small insignificant quantities)	X
6.	Millet	Rainy season	5	5	100	0	L (very small insignificant quantities)	X
7.	Beans	Rainy season	5	30	100	0	L (very small insignificant quantities)	X
Vegetables								
	Rape/kale	All year		40	100	0	L (very small quantities)	X
	Pumpkin leaves (chibwabwa)	Rainy season		60	100	0	L (very small quantities)	X
	Sweet potato leaves (kalembula)	Rainy season		70	100	0	L (very small quantities)	X
	Cassava leaves (katapa)	All year		5	100	0	L (very small quantities)	X

Bean leaves (chimpapila)	Rainy season	30	100	0	L (very small quantities)	X
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Note: rainy season is generally from November to March

Local (L): Within the community of around Siavonga

External (E): anywhere outside Siavonga

- While sweetpotato production is very low, there is a lot of sweetpotato sold on local markets from outside of the district. The sweetpotato is available from April to July.

ANNEX 2. PRIORITY COMFA+STAPLE FOODS

Food	Form in which it is consumed	Form of processing/ value addition	Means of storage
Fish (Breams and other small species except kapenta)	-whole	-fresh -sundried -smoked	-not stored for long as it is readily available
Maize	-whole grain -nsima (pap)	-fresh -dry grain boiled -milled into maize meal	-in sacks as shelled grain -stored in small round structured – raised from ground (chimpaka) -anti grain borer chemical added (chirindamura)
Sweet potato	-whole	-fresh	-not stored but eaten when in season
Vegetables			
Rape (kale)	-shredded	-fresh	N/A
Sweet potato leaves	-shredded	-fresh -dried	-in sacks

ANNEX 3. LIST THE FIVE PRIORITY STAPLE FOODS FOR SALE

Food	Form in which it is sold (unprocessed/processed)	Mode of sale (Retail/wholesale)	Form of processing
Fish	-Unprocessed/raw -processed	Both	-fresh -sundried -smoked
Rape (kales)	-raw	Retail	N/A

ANNEX 4. FOODS BOUGHT FOR CONSUMPTION

Food	Level of importance to diet (1-5)	Form in which it is purchased (Raw/processed)	Mode of purchase (Retail/wholesale)
Maize	5	Processed (maize flour)	Retail
Sweet potato	5	Raw	Retail
Irish potato	1	Raw	Retail
Cassava	5	-Raw -cassava flour	Retail
Deep Green Leafy Vegetables (DGLV)	5	Raw	Retail
Chicken	2	Raw	Retail
Beef	2	Raw	Retail

1=low; 5=very important

ANNEX 5. FOOD ITEMS FED TO INFANTS

Food item	Mode in which it is consumed	Mode of preparation	Frequency of consumption per week (average)
Fish (all sorts)	-bit of flesh -gravy	-boiling -frying -roasted	7
Maize	-porridge -nsima/pap -whole maize grain (soft)	-boiling -cooked	7
Sweet potato	-mashed -fries	-boiling -frying	-7 (if in season) -0 (when out of season)
Irish potato	-mashed -fries	-boiling -frying	1
Cassava	-mashed	-boiling	1
DGLV	-whole -gravy	-boiling -frying	3

		-mixed with groundnut powder (ifisashi)	
Chicken	-flesh -gravy	-boiling -frying	1
Beef	-flesh -gravy	-boiling -frying	1

Note: 0=none, 1=rare to 7= very high such as every day

6. Do you produce fish powders?

a. If yes, how do you prepare it?

- No we don't produce any fish powders
- But we know about fish powders since we were even trained on how to make and use the powders; especially for porridge for babies. Some people from government came and taught us about two years ago.

But why don't you make fish powder?

- We just feel lazy.
- We are not just serious about it.

Would you be interested if someone came to train you again?

- Yes we would be interested

b. How long is storage for the powders?

N/A

c. Who are key food processers (Men/women/youths?)

- women

7. Who are key entrepreneurs of local foods (Men/women/youths)?

- Men

a. list five local food items that are sold by entrepreneurs in your area

- fish (all species and in all forms)
- maize meal
- sweet potato
- Irish potato
- DGLV

Supplementary notes

A focus group discussion (FDG) was held in Kambimbi fishing camp of Siavonga which was aimed at collecting data regarding the locally available staple foods. These foods are the ones earmarked to be used in combination with kapenta powders for the infant formulas. Aspects of the FDG included seasonality and sources of foods not farmed in the area. The FDG was composed of 12 women and three men.

- It was noted that there is not much farming in the area; mainly due to the fact that the soils are not arable; and rainfall is usually low in Southern part of Zambia generally. The region is prone to droughts.
- Even when there is a chance to try, the people are used to fishing for their livelihoods and so will not pay much attention to farming.
- Maize is one of the crops that they make an effort to farm; but only few households. However, they will still buy maize/maize meal at all costs as it is the main starch that is

consumed at least twice per day

- DGLV are grown at low scale but will be prevalent in rainy season. They are plenty and there is potential to preserve these so they can be available all year round
- While sweet potatoes and pumpkins are not grown that much also, they are cheaply available soon after the rainy season and can equally be preserved and be available all year



About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions