



Food and Agriculture Organization
of the United Nations

MAXIMIZING NUTRITION IN FISHERIES AND AQUACULTURE USING A FOOD SYSTEMS APPROACH

AN EVIDENCE-BASED LITERATURE REVIEW



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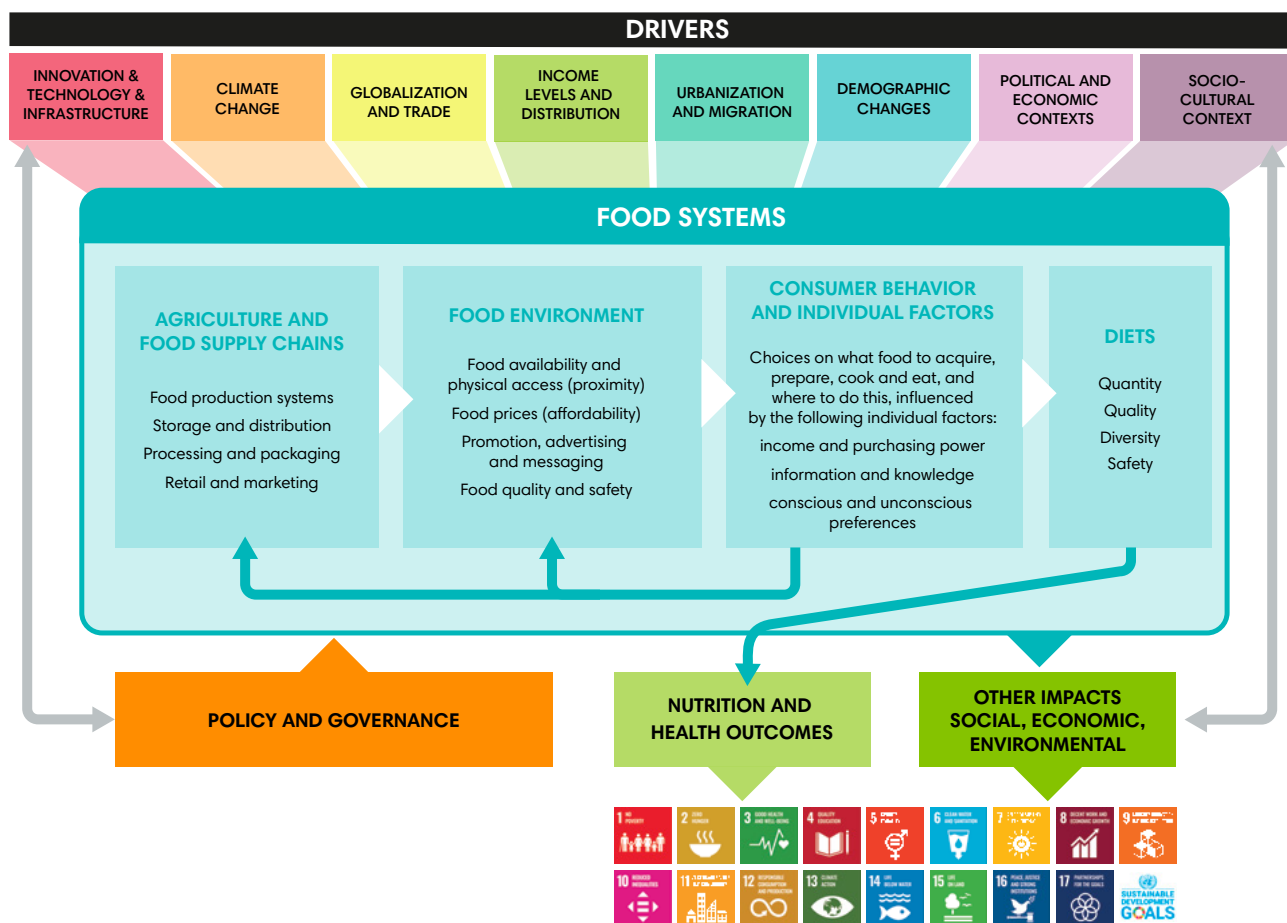
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Context

This literature review is one of a series of four sector-specific reviews aimed at informing the development of guidance notes for the integration of nutrition across the crops, fisheries and aquaculture, forestry and livestock sectors in 12 sub-Saharan African countries. The guidance notes will provide practical suggestions on how to formulate programmes and policies that contribute to sustainable healthy diets and enhanced nutrition. Both the literature reviews and the guidance notes form part of a collaboration by the Food and Agriculture Organization of the United Nations (FAO), Action Against Hunger and World Vision to support national decision-makers and programme implementers in strengthening sector policies, programmes and investments for improved food security and nutrition outcomes, especially for those who currently or could rely on this sector for subsistence and sustenance.¹ The present literature review focuses on mainstreaming nutrition in fisheries and aquaculture (hereafter the “fisheries sector”),² using a food systems approach. Food systems refer to the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, marketing and advertising, preparation, consumption and disposal of food products that originate from crop and livestock production, forestry, fisheries and aquaculture, as well as the broader economic, societal and natural environments in which these diverse production systems are embedded (FAO *et al.*, 2019).

Figure 1. Food systems for healthy diets



Source: Adapted from the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security (FAO, Rome, 2017).

¹ The project covers the following countries: Burkina Faso, Chad, Côte d'Ivoire, the Democratic Republic of the Congo, Eswatini, Ghana, Kenya, Mali, Mauritania, Senegal, Uganda and Zimbabwe.

² The term “fisheries” refers to wild fish capture systems, and “aquaculture” to farmed fish breeding systems. Both subsectors are covered by the term “fisheries sector” (FAO, 2016).



The review also highlights challenges faced by the most vulnerable groups in this sector, such as small-scale fishing communities and the women and youth within them (FAO, 2015).

Methodology and structure

In developing this review, a desk study of both peer-reviewed scientific literature and grey literature was conducted; the resulting information on the contribution of the fisheries sector towards food and nutrition security has been organized across the following key questions:

- How does the fisheries sector contribute to sustainable healthy diets and the prevention of malnutrition?
- How is the fisheries sector organized within the framework of the food system?
- Who are the most vulnerable groups in the fisheries sector? What are the drivers of malnutrition and/or poverty in these groups?
- What are the main limitations and drivers that affect the fisheries sector?
- What are the most relevant types of interventions that may enhance the contribution of the fisheries sector to sustainable healthy diets and improved nutrition, while also addressing the challenges faced by the most vulnerable groups in this sector?

Background

The fisheries sector is the fastest growing of all food sectors, and has significant potential to meet the food and nutrition needs of a growing global population (FAO, 2018). As the sector's role has grown in this context, so has the attention and importance assigned to it, by stakeholders in society, business and policy-making (Adarme-Vega, Thomas-Hall and Schenk, 2014; Khalili Tilami and Sampels, 2018). Although the sector offers ample opportunities to reduce hunger, improve nutrition, alleviate poverty, generate economic growth and ensure better use of natural resources, it is still oriented almost completely towards industrial interests, ignoring both the nutritional and biodiversity benefits of fish in the domestic value chain and the communities that depend on fisheries for their livelihoods, food security and nutrition (FAO, 2018). Due to its critical role in the food system, supporting the fisheries sector is essential for achieving the 2030 Sustainable Development Goals.

How does the fisheries sector contribute to sustainable healthy diets and prevent malnutrition?

Animal source foods (ASFs) are a vital source of nutrition during the first 1 000 days of a child's life (Victoria *et al.*, 2010). As an ASF, fish is particularly nutrient-rich, and contains a substantial amount not only of protein, but also of omega-3 fatty acids, minerals such as potassium and calcium, microminerals such as iron and selenium, fat-soluble vitamins such as vitamins A, D, E and K, and water-soluble vitamins such as vitamin B complexes (Khalili Tilami and Sampels, 2018). Both epidemiological and randomized controlled trial studies in young children have shown that daily consumption of approximately 60 g of fresh fish can reduce stunting rates by up to 47 percent (Colecraft *et al.*, 2012; Headey, Hirvonen and Hoddinott, 2018). Fish is also a rich source of nutrition for adolescents and adults (especially women of reproductive age) and is associated



with a 36 percent reduction in mortality from cardiovascular disease, as well as with improved cognitive function (Danthiir *et al.*, 2018; Manson *et al.*, 2012). It is therefore important that adequate supplies of fish are available and that the nutritional content of fish is retained along the value chain.

How is the fisheries sector organized within the framework of the food system?

Fisheries account for a significant proportion of the world's food production, processing, trade, retail and consumption (HLPE, 2014). In 2016, global fish production peaked at 171 million tonnes. Approximately 161 million tonnes was used for human consumption, accounting for 17–20 percent of the world's total protein intake. The remainder was utilized for non-food purposes such as fishmeal and fish oil (FAO, 2018). The resulting fish trade contributed approximately USD 362 billion to the world's economy for the year, and provided jobs for approximately 59.6 million people. As the global population grows and becomes more affluent, the demand for fish and the relevance of fisheries will only increase further (FAO *et al.*, 2019).

1. Food supply chain

In the first step of the fisheries supply chain, fish is either caught or farmed (FAO, 2018). The amount of fish captured depends on various factors (including the type and capacity of the vessel, the technical knowledge of the fishers or fish farmers, the status of natural fish stocks and of the ecosystem, and climate resilience), whereas the nutritional value depends on the diversity of species captured or farmed. This diversity in turn is dependent on the status of nutrient-rich fish stocks and on consumer demand for certain fish species. Due to a lack of (and/or failure to implement) existing policies governing overfishing, pollution, piracy and natural resource management, commercial fisheries often overexploit natural resources in a bid to land the largest possible volume of high-value fish (FAO, 2018). For example, 33 percent of the world's fish stocks are overexploited (fished beyond long-term maximum sustainable yield), with significant impacts on the aquatic food chain and surrounding ecosystem. Moreover, activities such as aquaculture can also have a significant negative ecological impact (Bhavsar, Pandya and Jasrai, 2016). A balance between productivity, biodiversity, commercial value and bioecological sustainability must therefore be considered when capturing or farming fish.

Upon capture, fish is handled/stored, processed and finally transported to retailers for sale or direct consumption (FAO, 2018). As fish is highly perishable, the sector faces many food storage and human safety challenges, ranging from microorganisms such as *E. coli*, *Salmonella* and *Listeria* to contaminants such as microplastics and dioxins (FAO and WHO, 2020a; WHO, 2015). Appropriate food safety knowledge and regulations must be applied to maintain the safety and quality of fish along the supply chain. This means implementing cold chain infrastructure during transport, and freezing, vacuum packing, drying, canning, salting or pulverizing fish to preserve shelf life for storage and retail (FAO, 2019). Failure to apply appropriate safety procedures may cause food-borne diseases to spread (FAO and WHO, 2020a), resulting not only in increased human health risk but also in unnecessary food loss and waste (FAO, 2019). In addition to the challenges of food safety and quality, a substantial proportion of fish is also lost during capture and processing. On average, 35 percent of the global catch is lost along the value chain (20 percent in high-income countries and 30 percent in low-income countries), with 9 to 15 percent coming from fish discards in the sea (mainly from larger vessels) and an equally large amount from disposal (of fish heads, viscera and bones) during processing. As a result, there is a constant loss of both commercial and nutritional potential across the fisheries value chain. Reducing unnecessary loss and waste due to these issues therefore offers a clear opportunity not only to increase the affordability of fish for consumers in general, but also to improve both the livelihoods and nutritional status of all actors along the fisheries value chain.



2. Food environment

Food-based dietary guidelines (FBDGs) in many (mostly high-income) countries recommend regular consumption of fish for its nutritional benefits (FAO, 2016). Both producers and retailers have capitalized on this with regard to the production, promotion and sale of fish. Naturally, most of these efforts are disproportionately focused on a small number of specific medium to large fish species of high commercial value (such as salmon, tuna, tilapia and herring), which are often produced through large-scale commercial operations (i.e. aquaculture or industrial fishing, most commonly in marine environments). Many smaller fish species, including those of inland African reservoirs and lakes, have been found to have equivalent or even greater nutritional content (for example in the case of carp, bream, sardines or mackerel.) than the higher-value species. But unfortunately, because these smaller fish are often assumed to have lower nutritional value, they tend to be ignored in the commercial market, and are often used instead as fish feed for aquaculture (Smith and Basurto, 2019). This focus on larger, farmed fish species of higher commercial value can have negative consequences on the availability and diversity of nutrient-rich fish in the market. It may also result in fish being priced at a premium relative to other ASFs, making it less affordable and therefore less accessible for lower-income consumers (FAO, 2015). And finally, it may result in the marginalization of smaller-scale producers who are unable to capture fish of high commercial value. Addressing this imbalance would require promoting and expanding the availability of more diverse fish species, through both marketing and policy initiatives (FAO, 2016).

3. Consumer behaviour

There are two groups of consumers for the fisheries sector – those who produce and consume fish directly, and those who purchase fish from retailers (FAO, 2018). In both cases, consumer behaviour influences the fisheries value chain through demand for specific types of fish. And in both groups, those who purchase, prepare and serve the fish are often women (HLPE, 2014). Through the regular purchase – or ration catch³ – and preparation of a diverse range of fish, consumers can add ASFs to their diet and improve their dietary diversity, while increased consumer demand can support increased growth in the fisheries sector (FAO, 2016). As indicated in the previous section, consumers should also ensure that appropriate safety precautions are taken while storing and preparing fish, to avoid food-borne disease and food waste. It should be noted that poor households are more likely to consume fish that is deep-fried or smoked, resulting in increased exposure to unhygienic conditions, as well as lower product quality (FAO and WHO, 2020b). For consumers to fully benefit from fisheries food systems, policies and programmes should therefore ensure they are empowered and educated on the nutritional benefits, purchase, safety and preparation of fish (FAO, 2016).

Who are the most vulnerable groups in the fisheries sector? What are the drivers of malnutrition and/or poverty in these groups?

The most vulnerable groups in the fisheries sector are typically informal small-scale fisheries (SSF) communities (Smith and Basurto, 2019). These communities are usually made up of self-employed individuals, families and/or cooperatives living in rural areas. In addition to their role as direct food providers for their households and communities, many of them also work in commercial fishing, processing and marketing (FAO, 2018). They are engaged in capture fishery, and are dependent on small, light

³ The term “ration catch” refers to fish caught by fisherfolk and rationed for consumption rather than sale.

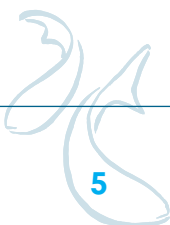
boats, with little to no engine power. SSF communities often have limited physical and financial access to inputs and infrastructure (including fishing, storage, processing, transport and retail infrastructure), and are isolated from other stakeholders in the fisheries sector (Smith and Basurto, 2019). In many cases, the fishing infrastructure is the property of absentee owners, who collect rent on their equipment. For these reasons, SSF communities often have limited commercial freedom and thus resort to catching low volumes of fish from inland and marine waters, and processing them via simple methods such as drying or salting. A limited portion of this fish may be used for their own consumption; however, due to the low volume of catches and poor preservation methods, most of the fish is sold or traded for subsistence.

In addition to full- or part-time employment (as fishers and fish workers), seasonal or occasional fishing and related activities provide vital supplements to the livelihoods of millions (FAO 2015). Small-scale fisheries employ more than 90 percent of the world's capture fishers and fish workers, about half of whom are women. Men normally play the role of fishers, while women typically process the fish caught. These communities land less fish but rely almost completely on fishing for subsistence; while only 80 percent of fish in large-scale fisheries is destined for human consumption, nearly 100 percent of the fish caught by SSF is consumed by people (FAO, 2016).

However, policy makers and institutions often focus predominantly on the economic importance of fisheries and ignore the nutrition and food security benefits of the sector – especially for those who rely on fishing for subsistence and sustenance (FAO, 2016). As SSF are most commonly involved with fish of lower economic value, policies do not often support SSF capture, farming, market access, price parity/anti-monopoly measures, and business and food and nutrition education. As a result, SSF communities are often marginalized, and suffer from food insecurity and malnutrition – more than 30 percent are food insecure, while stunting rates in children can range from 22 to 26 percent (FAO, 2016). Furthermore, women in these communities do not usually have formal recognition as fishers, and must bear the double burden of fish processing and child care. Due to a lack of both resources and opportunity, both women and children are particularly vulnerable in these already marginalized SSF communities.

What are the main limitations and drivers that affect the fisheries sector?

- a) The fisheries sector overwhelmingly targets industrial fish capture and farming (Smith and Basurto, 2019).
- b) The fisheries ecosystem is substantially damaged by overfishing and pollutants (Bhavsar, Pandya and Jasrai, 2016; FAO, 2018).
- c) Rural fishers and fish farmers require support for the procurement of modern fisheries equipment and for capacity development (FAO, 2016).
- d) Smaller fisheries and fish farmers may be significantly affected by food-borne disease outbreaks and large-scale epidemics such as COVID-19. They are less likely to be well-prepared for dealing with such outbreaks and their livelihoods could suffer (FAO and WHO, 2020a).
- e) Many women in fishing communities act as caregivers and providers but do not have access to the same resources, income and opportunities as their male counterparts. Likewise, youth are an essential part of the fisheries sector workforce, but often lack access to training as well as to sufficient nutrition (FAO, 2016).



What are the key interventions in the fisheries sector that can contribute to sustainable healthy diets and improved nutrition while addressing social inequity?

Based on the issues identified in this review, there are several key interventions that should be considered when designing and implementing fisheries policies and programmes:

- a. Educating and raising consumer awareness on the nutritional and safety aspects of a diverse range of fish;
- b. Supporting income, capture, market access, business acumen and food and nutrition education in marginalized SSF communities;
- c. Improving the diversity of fish caught and brought to the domestic market;
- d. Practising sustainable resource management during fish capture and farming;
- e. Maintaining the safety and quality of fish during storage, handling, transport, processing and retail; and
- f. Promoting and ensuring accessibility to a diverse range of fish for vulnerable consumers via institutional procurements.

This literature review informs and complements the development of an accompanying guidance note on the fisheries sector, providing practical suggestions on the formulation of programmes and policies that contribute to better nutritional outcomes while taking environmental, social and economic impacts into account.



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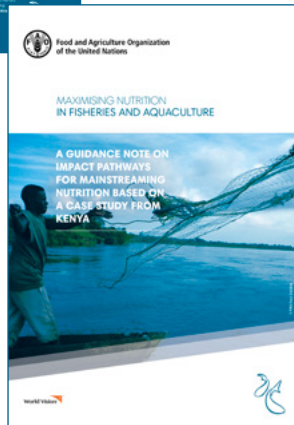


For more information check also:



Maximizing nutrition in the fisheries and aquaculture sector in Kenya

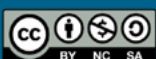
In brief



Maximizing nutrition in the fisheries and aquaculture sector

A guidance note on impact pathways for mainstreaming nutrition based on a case study from Kenya

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