



Fish for life: nutrition and development in Eastern Africa and Western Indian Ocean

1. State of nutrition and food insecurity

Over the last decades significant progress has been made in reducing hunger and poverty and improving food security and nutrition at the global level. Many African countries have enjoyed this positive development, however some countries are still affected. Improved production methods and the use of new technological advances have contributed to more efficient resource use and improved food security. However the world, and in particular, some African countries, still have major challenges ahead; despite positive developments, concerns persist. Some 795 million people are still considered undernourished, despite a drop of 167 million over the last decade, and 216 million less than in 1990–92. In recent years, progress has been hindered by slower and less inclusive economic growth, as well as political instability, in some developing regions, such as Central Africa and western Asia.

In sub-Saharan Africa as a whole, just under one in every four people was estimated to be undernourished in 2014–16, compared to one in every three people in 1990–92 (see Figure 1 below). However, this is the highest prevalence of undernourishment for any region, numbering about 220 million hungry people in 2014–16. In sub-Saharan Africa the number of undernourished people increased by 44 million between 1990–92 and 2014–16, due to the region's high population growth rate of 2.7 per cent per year (SOFI, 2015).

Undernutrition has a direct impact on a country's social and economic development. There is a growing consensus and understanding of the consequences of child undernutrition at the individual and community levels, notably losses in physical and cognitive capacities. Globally, tremendous progress has been made to reduce the rate of stunting (low height-for-age) over the past 20 years. In Africa, the reported rate of stunted children decreased from 41.6 per cent in 1990 to 35.6 per cent in 2011. Nevertheless, over the same period, the absolute number of stunted children increased from 45.7 million to 56.38 million. The largest proportion of these 22.8 million children was found to be in East Africa, representing more than 40 per cent of all stunted children on the continent.

To alert policy makers, recent studies are informing on how economic growth is affected by undernutrition in Africa¹. Results are available for six of the 20 countries engaged in the IOC-SmartFish project, the loss in percentage of the GDP being from 3.1 per cent in Swaziland to 16,5 per cent in Ethiopia per year (see Table 1)

¹ The Cost of Hunger in Africa (COHA) study is a project led by the African Union Commission (AUC) and the New Partnership for Africa's Development (NEPAD) Planning and Coordinating Agency and supported by the UN Economic Commission for Africa (ECA), and the UN World Food Programme (WFP). <http://www.costofhungerafrica.com/>

Table 1. Global cost of hunger

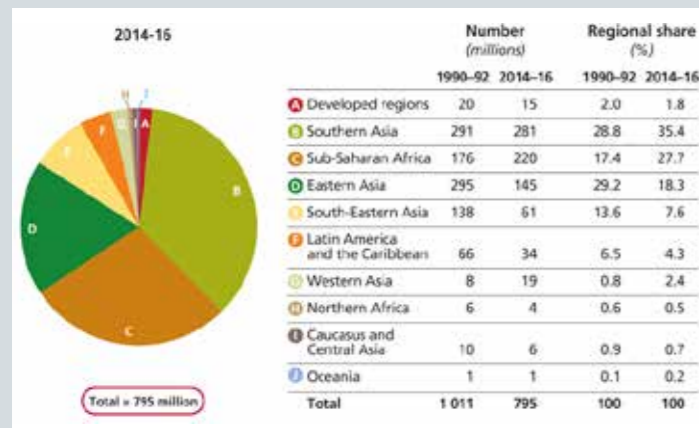
Countries	Loss in local currency	Loss in US \$	Loss in % GDP
Ethiopia	ETB 55.5 billion	4.7 billion	16.5%
Swaziland	SZL 783 million	92 million	3.1%
Uganda	UGX 1.8 trillion	899 million	5.6%
Madagascar	MGA 3 384,5 billion	533.6 million	14,5%
Rwanda	RWF 503.6 billion	820 million	11.5%
Malawi	MKW 147 billion	597 million	10.3%

Source: Cost of Hunger in Africa. National reports, 2012 data

Undernutrition is still gravely hampering both the immediate and future socio-economic development of these countries. The world community has still to address great challenges in order to provide adequate food and nutrition security to a growing human population, which is expected to reach 9.7 billion by 2050. Between 2015 and 2050, the populations of 28 African countries are projected to more than double. By 2100, ten African countries are projected to increase by at least five-fold including seven countries in the Eastern and Southern African region (Burundi, Democratic Republic of Congo, Malawi, Uganda, United republic of Tanzania, Somalia and Zambia).

This SmartFiche aims to highlight how fish and fishery products can better contribute to the hunger challenge and provides a particular focus on their contribution to better nutrition in Eastern Africa and the Western Indian Ocean region. It draws on initiatives developed with support of the IOC-SmartFish project to highlight remaining stakes, challenges, lessons learnt and to put forward recommendations.

Figure 1. The changing distribution of world hunger: numbers and percentages of undernourished people by region, 1990-92 and 2014-16 (SOFI, 2015).



2. What fish can do to improve nutrition and combat food insecurity

In the mid-60s per capita fish consumption was around 10 kg per year, today per capita consumption has doubled, reaching 20 kg per year at the global level. However, in Africa as a region, consumption is currently below 10 kg per capita per year and this is not expected to increase significantly. This is primarily due to an expected high population growth in most African countries. In those countries involved in the SmartFish project, the situation varies greatly from high consumption in Seychelles (58 kg per year), to very low per capita consumption of less than 5 kg/year in Ethiopia, Eritrea, Djibouti, Somalia, Sudan, Zimbabwe.

In general, statistics record the contribution of fish in terms of protein intake per capita. At the global level, fish accounts for about 17 per cent of animal protein intake (18 per cent in Africa).

In Eastern Africa and the Western Indian Ocean region, some countries' protein intake through fish reaches 33 to 55 per cent (Malawi, Seychelles, Uganda, Congo, Comoros) whilst in other countries the intake is no more than 3 per cent (Ethiopia, Sudan, Djibouti, Eritrea, Somalia, Zimbabwe).

Looking at all sources of proteins supplied per day at the African level in 2013, fish and seafood ranked fourth after cereals, pulses, milk and starchy roots. Bovine and poultry meat ranked 7th and 8th respectively (FAO Food Balance Sheets, 2016). In Uganda for example, fish and seafood ranked third as a source of protein after cereals and pulses, whilst meat (bovine) came in 8th position.

However, fish and seafood do not only provide protein.

Fish and other foods from the aquatic environment are also a source of long-chain omega-3 fatty acids (EPA and DHA), which are important for healthy brain development in children. Experts agree that fish consumption, particularly oily fish, is essential for an optimal development of a child's brain and neural system. It is therefore particularly important to include fish in the diets of pregnant and breastfeeding women and in the diets of children, particularly during the first two years of life (the 1,000 day window). Strong evidence also underlines how consumption of oily fish, lowers the risk of coronary heart disease.

Nowadays, more and more attention is being given to fisheries products as a source of micronutrients such as vitamins and minerals, small amounts of nutrients that are essential for a healthy life. Fish products are an important source of micronutrients, and this is particularly true in the case of smaller-sized fish that are consumed whole (head and bones). These fish are an excellent source of many essential minerals such as iodine, selenium, zinc, iron, calcium, phosphorus and potassium, and vitamins such as A and D, and several B vitamins. Although not widely done, the head and bones from bigger fish can also be consumed if further processed.

Some micronutrients found in fish and their properties include:

- Iodine: important for brain development in children, and in controlling metabolism, the conversion of food into energy in the body. Around one billion people are deficient in iodine;
- Vitamin B: important for converting food into energy;
- Zinc: essential for reducing deaths due to diarrhea amongst children, and could eventually save 800,000 children's lives every year;
- Iron: an important component in the blood, and essential for transporting oxygen to all the parts of the body. Iron deficiency affects almost one third of the global population;
- Calcium, together with vitamin D: important for healthy bone development;
- Vitamin A: crucial for the immune system to fight diseases, and important for healthy eyes.

Although progress in reducing hunger levels has been encouraging, 2-3 billion people are still deficient in one or more micronutrients. Micronutrient deficiency is often referred to as the 'hidden hunger' as it is less visible and more difficult to measure: this could partially explain why progress in reducing levels of micronutrient deficiency has been limited so far.

Fish and fishery products are a source of many nutrients that are difficult to find in most other foods. Throughout Africa fish is mainly captured in the wild. In situations following disasters,



where crops are destroyed or food production is seriously affected, fish is often still available in the sea or lakes. With simple equipment, fish is available for people in need. Fish is a source of many nutrients and could play a particular role in specific periods of food insecurity.

At the global level, fish and seafood play a greater role in the nutrition of low-income countries on the African continent (primarily derived from capture fisheries) and in the Asian region in general (primarily derived from aquaculture), than anywhere else.

Within the framework of the IOC-SmartFish project, a large variety of initiatives related to nutrition, awareness building, fish consumption, food safety, reduction of losses, trade and even fisheries management, are aimed at directly or indirectly increasing the fish and fishery value chains' contribution to the hunger challenge in Eastern Africa and the Western Indian Ocean region.

Between 2012 and 2017, specific initiatives targeting fish consumption/food security were supported in Djibouti, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Rwanda, Tanzania, Uganda and Zambia. Despite different entry points based on country requirements – reduction of food losses, food safety, nutrition, fish consumption, increased food availability – the results were the same: the nutritional benefits of fish and related issues and challenges are still too often not well-known or understood by consumers, professional groups, administrations or policy makers. Tackling these challenges will help to increase the contribution of fish in the fight against hunger. Related challenges and lessons learnt from some of these initiatives are described below.

3. Awareness, Awareness!

In 2013, relationships between the importance of fisheries and its recognition in food security and nutrition related strategies were analysed at national and regional economic commission levels (Kurien and Lopez, 2013 and SmartFiche N°2). The analysis showed that, in global terms, significant progress was made to better integrate fisheries in such strategies over the past decade; but also highlighted large differences between countries and between regional economic commissions (RECs). However, the specific contribution of fish to improved nutrition, which is a specific aspect of food security and a relatively new field, appeared far less known and understood across all levels.

As a consequence, initiatives were launched in targeted countries combining, in most cases, awareness-raising, at both field and administrative/policy levels, with a stronger focus on nutritional aspects. Changing policies takes time, but well-documented evidence can have a tremendous impact not only at the policy-making level, but also at civil society and community levels. Support for local movements and learning from partner communities is the only way to ensure that efforts towards change are sustained overtime. Informing policies as well as initiating changes on the ground were judged essential. Changes in food and cooking habits, to combat undernutrition requires awareness from the populations concerned as well as awareness from support services (educational, health, fishery) or other important social actors (such as churches). This is a first step towards change.

In this context, specific campaigns on fish consumption and nutrition were organized in Zambia, Malawi, Kenya, Rwanda, and Djibouti, pre-ceded by a fish consumption analysis in targeted areas, to better understand consumption factors (availability, price, family size, etc.), as well as how fish is prepared.

The overall objectives of the campaigns in the five countries were to strengthen food security by increasing the benefits



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gained from the consumption of fish; and to promote better habits of fish consumption. In Malawi, Rwanda and Zambia, a third objective to seek solutions to increase the amount of fish available on the domestic market was also included.

In general, all the campaigns and related interventions were aimed at promoting and disseminating knowledge about the health benefits of consuming fish to encourage new habits of fish consumption. In order to do this, the strategic canvas involved acting simultaneously with local health and fishery authorities, as well as intervening at the community level. This double approach was intended to reinforce each other's impact and acceptability towards change. The target audience was diverse and from a range of sectors: health workers, fisheries officers, children, women, and fish operators from the private sector, amongst others.

More specifically, the campaigns attempted to create awareness of the benefit of fish as a source of important proteins and nutrients. To embrace the various themes, activities were articulated around the following topics:

1. "A little fish does a lot of good": highlighting the first 1,000 days of life, including pregnant women;
2. "A little fish feeds a lot of people": highlighting the value of fish for the whole family, from young to old;
3. "A whole fish does a lot of good": emphasising the value of eating 'all' the fish (bones, skin, etc.) for improved nutritional value;
4. "A little fish gives you a long life": highlighting the health benefits for disease prevention and healthy growth across all age groups but with an emphasis on the elderly;
5. "A little money buys a lot of fish": showcasing the cost efficiency of fish over other proteins;

6. "Better quality": putting forward the importance of good hygiene and handling practices to preserve the nutritional value of fish and to increase the amount and/or quality of fish available on the market;
7. The potential of fish by-products (e.g. fish powder) for food and nutrition security.

The specific activities (not all performed in all countries and sites) included: community meetings to explain and discuss the messages, cooking demonstrations, competitions for children, TV spots, radio spots, use of local celebrities, training of health workers, distribution of thematic documentation and signs in public areas.

In each country, local civil society organizations implemented the activities on the ground, with various levels of involvement from the national authorities. Depending on the country partners were initially more involved in health, awareness-raising, social support, etc. As such, the campaigns were also an opportunity to build the capacity of partner organizations in terms of the contribution of fish to nutrition. For example, in Malawi, almost 25,000 people were exposed to the campaign; in Zambia an estimated 15,000 people were reached through various activities and in Rwanda, 600 community health workers were trained on the health benefits of eating fish; campaign messages thereafter indirectly reaching a further estimated 15,000 people.

All the campaigns were received in a positive light. Most of the targeted communities were not well – or at all – aware of the nutritional values of fish before the campaigns. They were however, all interested in learning more about these particular aspects, and were also keen to learn how to prepare and cook fish thanks to the cooking demonstrations that were organized.

One common point raised by all beneficiary countries was that fish supply remains an issue and is an obstacle to ensuring

the proper consumption of fish in many regions. The general recommendation is to eat fish twice a week which, in some areas, can indeed be challenging. This explains the fact that initiatives emphasised the promotion of low-cost fish by-products and on lesser-known types of fish. This approach was very challenging due to various cultural barriers related to fish consumption.

Several areas of work need to be continued: (a) improve the supply of fish, in particular for the most vulnerable populations; (b) awareness-raising and promoting consumption of fish that are less consumed/known/appreciated; (c) improving hygiene and handling practices; (d) continue to raise awareness of the nutritional value of fish and cooking methods; (e) raise awareness of low-cost fish by-products, which can be a solution to cover needs during lean seasons/hunger gaps.

4. Reducing fish losses and waste

Food loss and food waste² refer to the decrease of food in subsequent stages of the food supply chain intended for human consumption, from initial production down to final household consumption.

Food loss does not spare fishery products; this issue has been tackled for many years but is so vast and important in most value chains, taking many forms at the various stages of the supply chain, that reducing food losses is a very long-standing effort involving everyone.

In relation to food security and nutrition, fish loss shall be considered through various dimensions, in particular:

- Loss in volume, reducing the amount of fishery products available for human consumption;
- Loss in quality, reducing the nutritional value of end products;
- Loss in income, reducing the capacity to buy other types of food than fish.

The SmartFiche programme undertook considerable work to reduce losses on specific value chains (Mud Crabs, small pelagics) and targeted various stakeholders from fishers to consumers no matter which species they were dealing with. The work involved³:

- Consumer education combining nutritional awareness and good practices to reduce home food waste and improve good cooking practices (Lake Victoria – Uganda, Kenya, Tanzania, Malawi, Rwanda, Zambia, Djibouti). Consumer education was done through a mass field campaign, and in some cases was doubled up with a national campaign (Djibouti, Kenya);
- Mass field campaign on losses and good handling practices through video training targeting the various stakeholders of the value chains: fishers, small processors, transporters, retailers, town and intermediary markets. This campaign targeted mostly 'high fishery spots' around Lake Victoria and Lake Tanganyika (Burundi, Congo, Kenya, Uganda, Tanzania);

² To simplify, "loss" relates to food losses throughout the whole value chain; waste is mainly food waste at the consumer level. In Africa, food loss is a much more acute issue than waste at the household level.

³ This work is partly described in SmartFiches 17 (Reducing Post Harvest Losses for Improved Food Security) and 18 (Consumer Education for Improved Security), and SmartFiches 3 and 40 on the Crab Value Chain

- Market rehabilitation and capacity building at fish markets (Madagascar, Burundi);
- Capacity building at the various stages of a value chain with the introduction of low-cost, locally adapted innovations such as in the Mud Crab value chain in Madagascar;
- Capacity building of targeted groups of small pelagic processors willing to engage in improving processing/packaging/marketing techniques and in producing higher quality products to improve quality standards (Zanzibar, Tanzania, Uganda, Burundi, DRC, Malawi, Rwanda, Zambia and Zimbabwe);
- Support for national and regional strategies on trade and on food security and nutrition.

All these initiatives complement each other with a view to reducing losses, improving product quality, raising awareness and implementing good practices at all levels. The case of the Mud Crab fishery has shown that it is possible to significantly reduce losses in a relatively short time (two to three years) by introducing simple, low-cost, locally well-adapted innovations/techniques. Such innovations allowed an increase of income at the stakeholder level (fishers, transporters, retailers); income that can potentially be reinvested in food. However, the Mud Crab fishery in Madagascar feeds an international export market (primarily Europe and Asia); it is known that changes of practices are likely to be quicker when there is a fast and visible reward as is the case for the Mud Crab. Investments made by stakeholders in new innovations not only allowed fishers to sell more but also enabled them to meet the demand for the export of live crabs which requires crabs to be fished and kept in better conditions to withstand transportation but also offers a higher price at the local level.

In the case of the small pelagics value chain, which is the most important regional fish value chain in East and Southern Africa contributing to food security, the situation remains much more complex and unusual.

Various initiatives have shown that losses can be reduced and quality improved by small changes in daily practices that require little investment. However, these investments (in time or money) do not show substantial returns at the end market as easily. In many places, the regional trade of low quality mass products still dominates the market, complicating efforts to reduce losses and improve the nutritional quality of products. Forces hindering such changes are stronger and therefore positive results are more scattered. Some lessons however, can still be drawn:

- Constant awareness-raising and capacity building to reduce quantitative losses through small changes such as better handling practices should be continued as the need to do so is high. It is a basic long-standing process. Didactic material is widely available in various formats (training videos, small illustrated books on good practices, simple illustrated cooking books, training of trainers' manual...). Experience within the IOC-SmartFish project has shown that such material is easily adaptable at low cost from country to country to reach the target audience;
- Consumer education is key to improve nutrition at the household level. This aspect is often a neglected in favour of the capacity building of fishers, processors and retailers etc. However, considerable progress can be done in the area of nutrition and food security at the right end of the value chain on losses, better use of what is available

or the preparation of more nutritious food. This is also an opportunity to strengthen coordination with other actors working at the field and national levels who often have a lack of understanding on what fish can specifically contribute to: health, social and educational services as well as confessional or traditional forms of organizations. Of course, changes of food customs, cooking habits, etc. at the household level are slow processes that require engagements with the younger generation; immediate impacts of initiatives are often difficult to measure but are worth the investment.

- The emergence in Africa of an intermediary market for better quality, better-packaged, labelled and marketed products is probably an opportunity in the long term that could be used as an overall lever up. An intermediary market for the emerging middle class living in capital cities and smaller towns is slowly bridging the gap between international export markets of high value, high quality products and the reality of most processors and small SMEs working in very basic conditions. Two elements need to be taken into consideration: Firstly, it is difficult for these SMEs and groups to develop and reach certain quality standards. A lot of effort is still required for these groups to become 'examples to be followed' by other local investors and processors in terms of improved quality and loss reduction. SmartFish' experiences and lessons learnt in this regard are described in SmartFiche 32. Secondly, this intermediary market is currently a niche market and the bulk of small pelagic production still goes to the mass low quality market. This ratio will change if demand from the intermediate market continues to grow in a context of tension between production and demand. Considering the tension that already exists in many places with regard to fish supply and increasing population in the region, it is important that fish remains available, even for the poorest and most vulnerable population, in its most nutritious forms to contribute to fight hunger and its consequences. Moreover, at this stage there is still no real, or sufficiently strong incentive to improve quality, or even basic hygiene, for the bulk of small pelagics traded in East Africa. To address these issues, national fish trade policies and strategies are necessary. Work has been done in this vein in Malawi, Mauritius, Uganda, Zambia and Zimbabwe, but this work shall be extended to other countries with regional considerations.

And finally, it shall be recalled that in the case of fisheries, supply is also limited by the resource itself. In the absence of the good management of most fisheries and in a general context of increasing fishing pressure and the overfishing of many stocks in Eastern Africa and the Western Indian Ocean region, getting the most from what is available is crucial to increasing food availability. A survey undertaken in Kenya, Malawi, Zambia, Rwanda, as well as other SmartFish initiatives have pointed out that fish supply to consumers is already a major issue in many places. Aside from reducing losses, other options were explored within the SmartFish programme, such as the development of by-products for human consumption using current fish loss waste. In fact this solution can also be considered as a way to reduce waste.

5. Better use of by-products

Fish by-products are often regarded as waste, and constitute about 50 per cent of the fish after processing into protein-rich fillets, the most valuable part from an economic point of view. In

addition to representing huge volumes of fish raw material, by-products are of higher value from a nutritional point of view. By-products are particularly high in micronutrients such as minerals and vitamins, nutrients that are lacking in many diets. One out of three people in the world have diets that do not meet their daily requirements of one or more micronutrients such as vitamin A, zinc, iron and iodine. Prevalence is highest amongst the most vulnerable group; women and children.

Fish liver, such as cod liver, has in some cultures been a valuable source of vitamin D and vitamin A, and is increasingly recognized as a valuable source of the long chain omega-3 fats. The value of fish bones as a source of many minerals such as calcium, zinc and iron is not widely known, although the levels of these minerals are 10-1,000 times higher in by-products compared to the main product, the fish fillet.

Low-cost products with a high concentration of essential nutrients can easily be made from fish by-products. If traditions and acceptability for such products allow for this, fish by-products can play an important role in combatting micronutrient deficiencies. A recent pilot project to produce a fish bone based mineral product showed high levels of most essential minerals, e.g. 85 mg/kg of zinc, 350 mg/kg of iron and 84 g/kg of calcium, in addition to significant amounts of iodine and essential omega-3 fats. Five to ten grams of this powder would provide all, or a significant amount, of the recommended daily intake of these nutrients.

In Uganda the IOC-SmartFish project carried out an activity to process the by-products of the Nile Perch (*Lates niloticus*). About 60-70 per cent of this fish ends up as a by-product (carcasses, skins and viscera) when processed, and very little of this ends up as food. The Food Bioscience and Agri-Business (FBA) at the National Agricultural Research Laboratories (NARL) collaborated with FAO to develop different micronutrient-rich fish powders from the by-products that could be used to enrich local diets, school meals, as well as an emergency food supplement for refugees.

Affordable and simple methods were used to transform skins and carcasses into fine powder for human consumption using a locally-made hammer mill. The resultant powder was analyzed for micro-nutrient content and packaged using different options for shelf life studies. The powder was assessed for acceptability of use in school meals by adding the powder to traditional school meals.

The powder, made from carcasses of the Nile Perch was the preferred product, and was appreciated by school children. A feasibility sub-activity conducted around industrial towns indicated that potential industrialists or entrepreneurs were willing to invest in a production line for powder intended for human consumption. Fish powders from Mukene are already widely used in Uganda, and a by-product based powder could be a good alternative to this. However, the adoption and popularity of fish powder as a micro-nutrient rich food supplement for local diets, school meals and emergencies is highly dependent on the industrial up-scaling of fish powder production.



6. Conclusion and recommendations

The contribution of fish to food and nutrition security would benefit from being looked at from a wider perspective by identifying other challenges that would have an impact on the contribution of fish to fighting hunger.

Firstly, per capita fish consumption in Africa is not expected to increase significantly due to population growth; the bulk of population growth in Africa is expected to be in East Africa and DR Congo.

Secondly, the management of fishery resources and the state of these resources is an important issue. The majority of fish consumed in Eastern and Southern Africa are small pelagic fish captured in marine and lake waters, but others species are also appreciated (Catfish, Cichlids, Tilapia...)⁴. The current situation in lakes and sea remains largely uncontrolled; overcapacity and IUU fishing are still widely spread, despite steps towards better management being undertaken in various places.

SmartFish, as other projects, place emphasis on MCS on the lakes, licensing and better coordination mechanisms for the management of shared resources, recovery plans, etc. However, the good management of the most consumed fish resources in this region is clearly not yet secure.

Thirdly, the value chain analysis carried out in the region highlighted how important the regional trade of small pelagic fish is. DR Congo is, and will continue to be, the largest market for this fish. For example, small pelagic processed fish can travel from as far as Zanzibar to supply the Congolese market (see SmartFiches n°7, 8, 16). This trade is largely unreported and unregulated, thus its negative and positive impacts on availability, access to fish, fish quality, etc. are largely ignored in national and regional strategies (trade, fisheries, food security strategies). If progress is not achieved faster, the provision of fish

in this region will rely more and more on fish imports from other areas of the world.

The SmartFish programme, as other programmes, has been working on the aspects highlighted in this Fiche, however, little progress has been made in most fields at national and regional levels.

Future initiatives to improve the contribution of fish in improving nutrition, and eradicating hunger in the region, should keep a focus on (a) improving the utilization of existing fisheries resources through the reduction of food losses and the improved use of fish by-products; (b) increasing the awareness of the benefits of eating fish amongst vulnerable populations, and also amongst social and health services; (c) improving access to fish and fish products for the most vulnerable (children, pregnant women, etc.); and (d) developing relevant strategies at the national and regional levels (health, trade, food security, fisheries).

Further reading

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⁴ Towards the north in countries bordering the red sea where other species dominate, such as larger marine pelagic species.



IOC-SmartFish is a regional fisheries programme managed by the Indian Ocean Commission, funded by the European Union and co-implemented by the Food and Agriculture Organization of the United Nations. IOC-SmartFish, which operates in twenty countries throughout the Indian Ocean Region, Southern and Eastern Africa, focuses on fisheries governance, management, monitoring control and surveillance, trade, and food security.

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