



Food and Agriculture Organization
of the United Nations

MAXIMISING NUTRITION IN FISHERIES AND AQUACULTURE

A GUIDANCE NOTE ON
IMPACT PATHWAYS FOR
MAINSTREAMING NUTRITION
BASED ON A CASE STUDY
FROM KENYA



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Abbreviations and acronyms

ACSM	Advocacy, communication and social mobilization
ASAL	Arid and semi-arid land
ASF	Animal source food
BMU	Beach management unit
CFS	Committee on World Food Security
CNAP	County Nutrition Action Plan
CNI	Community nutrition initiative
CSA	Climate-smart agriculture
EAC	East African Community
EEZ	Exclusive economic zone
FAO	Food and Agriculture Organization of the United Nations
FCS	Food consumption score
FSA	Food systems approach
FSN	food security and nutrition
HAB	Harmful algal bloom
HH	Household
HLPE	High-Level Panel of Experts on Food Security and Nutrition
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFI	International financial institution
KNBS	Kenya National Bureau of Statistics
LIFDC	Low-income food-deficit country
MALF	Ministry of Livestock, Agriculture and Fisheries
MPA	Marine protected area



MT	Metric tons
MTP	Medium term plan
SSA	Sub-Saharan Africa
SSF	Small-scale fishing
TOC	Theory of change
WB	World Bank
WFP	World Food Programme
WV	World Vision



Executive summary

The existing and potential contribution of capture fisheries and aquaculture (including mariculture) to a country's food security and nutrition can be significant. Fish represents a primary source of protein and essential nutrients, and there is a growing recognition of its nutritional and health-promoting qualities. More specifically, fish as an animal source of food (ASF) is particularly rich in nutrients and contains a substantial amount of protein, omega-3 fatty acids, minerals (e.g. potassium and calcium), micronutrients (e.g. iron, iodine, zinc and selenium), fat soluble vitamins (e.g. A, D, E and K) and water-soluble vitamins such as vitamin B complexes. Moreover, fish represents one of the most efficient converters of feed into high-quality food. Finally, fish and fish-related products provide income and livelihoods for numerous communities across the world.

Despite the importance of fish as a resource, to date there has been limited attention given to the sector's role in contributing to food security and nutrition strategies at the national level. Much of the existing literature has focused on the biological sustainability and economic efficiency of fisheries, neglecting issues linked to their contribution towards reducing hunger and malnutrition and to supporting livelihoods. Yet increased consumption of fish, and its addition to the diets of low-income populations (including pregnant and breastfeeding mothers and young children), offers an important means of improving food security and nutrition.

This guidance note focuses on mainstreaming nutrition into the fisheries sector, using Kenya as a case study. The guidance is part of a series of guidance notes examining the main food sectors (crops, fishing, forestry and livestock) in 12 sub-Saharan African countries¹ and providing practical suggestions on how to formulate programmes and policies that contribute to healthy diets and enhanced nutrition. This is part of a collaboration by the Food and Agriculture Organization (FAO), World Vision (WV) and Action Contre la Faim (ACF) to support national decision-makers and programme implementers in strengthening sector policies, programmes and investments aimed at improving food security and nutrition outcomes, especially for those who currently rely on or could rely on this sector for subsistence and sustenance.

Using a food systems approach, the methodology recognises the role played by different actors at all stages of the food chain – from production, processing and retail to consumption of food – while keeping a focus on the most vulnerable communities to ensure that their food security and dietary needs are met. The guidance notes have each developed theories of change (TOCs) to identify key transformative actions across the food system in order to enable healthy diets and improved nutrition. The resulting notes contain not only agreed TOCs, but also impact pathways in order to show in practical terms what entry points should be prioritised across the food systems to implement the required transformative actions. For Kenya, a TOC and impact pathways were developed for Kenya's artisanal coastal fisheries sub-sector.

The main problems identified in the small-scale fishing (SSF) sub-sector, and the corresponding hypotheses to address these, were: (i) **poverty and food insecurity**, with the hypothesis that any sustainable intervention aiming to increase SSF's contribution to the food security and nutrition of vulnerable households would have to address the underlying issue and effects of poverty in fisher households (HHs); (ii) **strengthening the SSF supply chain**, with the hypothesis that increasing the resources available to the SSF food supply chain would result in increases in the supply and value of fish and fish products available to consumers; (iii) **political economy of trading and marketing in SSF**, with the hypothesis that to get added value out of the food supply chain for SSF, individual fishers would have to organise into larger, strengthened groups which would allow them to compete with the "cartels" that dominate SSF in Kenya; and (iv) **status of existing fisheries**, with the hypothesis that in the

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

short to medium term, any significant increase in the contribution of fish to food security and nutrition coming from the SSF sub-sector will not likely come from existing, traditionally harvested fish stocks.

The **basic proposition** that informs the TOC and underlying impact pathways is that the SSF sub-sector has a potentially important role to play in contributing to both increased food security and nutrition (FSN) outcomes and the longer-term goal of achieving self-sufficiency in meeting the demand for fish through domestic fish production channels. The main opportunities appear to lie in developing under-exploited nearshore fish stocks, mariculture and, eventually, reaping the benefits derived from the recovery of existing traditional fisheries.

At present, domestic fish production from all sources is unable to meet demand in Kenya, resulting in increased dependence on imports. With stagnant, even declining contributions from capture fisheries, and with a growing population that has an increasing appetite for fish, the domestic supply gap is likely to increase and undermine any further gains in relation to the affordability of fish food and per capita fish consumption, particularly in poorer, more vulnerable communities.

In response, the Kenyan government is promoting an increase in domestic production by developing under-exploited stocks in the country's lakes and reservoirs, increasing access to and the volume of fish caught and harvested from Kenya's exclusive economic zone (EEZ), and developing the country's large aquaculture potential.

The proposed long-term impact for the food supply chain impact pathway is achieving healthy and sustainably harvested fisheries that contribute to improved FSN for consumers' diets and the socio-economic well-being of fisher HHs. A number of activities have been identified, grouped according to the main stages in the food supply chain. Short-term outcomes include better trained and organised fishers, increased fish diversity and production from under-exploited fish stocks, and increased HH income. The medium-term outcome would be demonstrating through a food systems approach (FSA), evidence-based options that would lead to improved fisher HH income, increased consumption of fish protein among Kenya's coastal population and, by extension, the entire country, as well as more sustainable fisheries in general. The key to the activities supported under the food supply impact pathway are such inputs and production steps that would result in a reduction of pressure on existing stocks, leading to their eventual restoration, including the protection of breeding grounds and use of legal equipment. Underlying these activities are the critical causal assumptions that co-operative societies, whether evolving from existing beach management units (BMUs) or newly created, would be welcomed by fishers and, if launched and supported, could prove to be successful in competing in the closed market system that SSF represents in Kenya. Only then can fishers benefit from the inputs/activities identified in the remaining stages of the food supply chain impact pathway analysis, as well as the other two impact pathway analyses, by moving up the value chain.

The proposed long-term impact for the food environment pathway is improved nutritional status, to be achieved by providing greater public access to more diverse, sustainably harvested fish and fish products that benefit the socio-economic well-being of fisher HHs and improve consumer diets. This would be accomplished by supporting research, a series of studies, market decentralisation, and/or through improved fish displays, pilot marketing of new fish products and training in the safety and hygiene of fish handling and processing. Projected short-term outcomes include increased demand for safe and sustainably caught recommended-size/table-size fish, and higher selling prices for fish and fish products sold in markets. This in turn would lead to the intermediate outcomes of increased access to fresh and processed fish that meet food-quality standards, and improved consumer diets and greater HH income for fisher families.

The proposed long-term impact for the Consumer Behaviour pathway is improved health outcomes in Kenyan HHs as a result of the benefits of an increase in fish consumption promoted through an integrated effort focused on research, planning, education and public awareness. This would be achieved through studies and



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capacity-building activities, and by promoting the mainstreaming of Kenya's fisheries' message – including recommended serving size- into food security and nutrition planning and policies forming part of country development plans, as well as through education (on dietary diversity, feeding practices, healthy diets, hygiene and sanitation) through BMUs, cooperatives, health centres, households, schools and local/regional public awareness campaigns. Projected short-term outcomes include: a strengthened policy and planning environment, increased public awareness of the contribution of fish to HH diets, and an increased presence of and demand for highly nutrient fish. This in turn would lead to the intermediate outcome of improved dietary diversity and micronutrient status for consumers. It should be noted that these findings also appear relevant to SSF operating at Kenya's inland capture fisheries.

Following the High-Level Panel of Experts' conceptual framework, a number of main drivers influencing the different components of the food systems and which could help achieve more diverse diets and nutrition outcomes from nearshore marine artisanal fisheries have been identified. Similarly, a number of assumptions and trade-offs relevant to the TOC and impact pathways have been described.

The main recommendations are to:

- **apply a food systems approach, supported by the three impact pathways, to the other priority fishery sub-sectors by way of a sector-wide approach** involving a multi-disciplinary team that would assess where opportunities exist to achieve better FSN outcomes;
- **mainstream FSN initiatives into the design of international financial institution (IFI) -supported projects** through the involvement of the existing FSN team, comprised of personnel from the

Ministry of Health and Ministry of Agriculture and Fisheries, which could be a powerful and cost-effective tool for getting the message out to decision-makers, communities and households;

- **build links between the fisheries and nutrition sub-sectors in the development of Kenya's County Integrated Development Plans (CIDPs) and budget** in order to promote greater visibility of these sectors (i.e. fisheries and nutrition);
- **integrate fish into Kenya's home gardening approach**, which promotes the small-scale production of nutrient-rich products such as fruits, vegetables and small livestock in order to improve household access to micronutrient-rich foods;
- **develop an ecolabeling pilot project** to test the value of ecolabeling for sustainably caught fish targeting the coastal and inland hotel and restaurant sector, beginning with interested BMUs (this is warranted given the potential for cross-marketing);
- **adopt an ecosystem approach to fisheries management (EAFM)** given the status of fish stocks and growing evidence of degradation of the coastal nearshore and inland water ecosystems, which if successful could also be a candidate for an ecolabel;
- **focus operations research on the availability and accessibility of healthy diets to small-scale fishers; and**
- **assess the socio-economic trade-offs** and how an FSA could better take into account social equity issues affecting food producers. This could prove to be a useful line of research for the future.



1. Introduction

Mainstreaming nutrition: from theory to practice

The existing and potential contribution of capture fisheries and aquaculture (including mariculture)² to a country's food security and nutrition can be significant. Fish represents a primary source of protein and essential nutrients, and there is a growing recognition of its nutritional and health-promoting qualities. More specifically, fish as an animal source food (ASF) is particularly rich in nutrients and contains a substantial amount of protein, omega-3 fatty acids, minerals (e.g. potassium and calcium), micronutrients (e.g. iron and selenium), fat soluble vitamins (e.g. A, D, E and K) and water-soluble vitamins such as vitamin B complexes (Khaliki and Sampels, 2018). Moreover, fish represents one of the most efficient converters of feed into high-quality food. Finally, fish and fish-related products provide income and livelihoods for numerous communities across the world (High-Level Panel of Experts, 2014).

The need to feed a growing global population and respond to increased demand for fish puts pressure on natural resources and challenges the sustainability of marine and inland fisheries and of aquaculture development. There is growing evidence of increases in resource conflicts (e.g. arising from competing demands for water resources in arid and semi-arid lands (ASALs) and ecological impacts (e.g. fishing down the trophic structure) associated with open access in overexploited marine capture fisheries. Common to other sectors, fish and its habitats are particularly vulnerable to the effects of climate change, and these pressures and conflicts are likely to grow through time.

Despite the importance of fish, to date, there has been limited attention given to the sector's role in contributing to food security and nutrition strategies at the national level. Much of the existing literature has focused on the biological sustainability and economic efficiency of fisheries, neglecting issues linked to their contribution to reducing hunger and malnutrition and to supporting livelihoods. Yet increased consumption of fish, and its addition to the diets of low-income populations (including pregnant and breastfeeding mothers and young children), offers an important means of improving food security and nutrition.

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² For the purposes of this guidance note, any reference to aquaculture includes mariculture.

³ The project covers the following countries: Burkina Faso, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Eswatini, Ghana, Kenya, Mali, Mauritania, Senegal, Uganda and Zimbabwe.

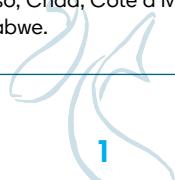
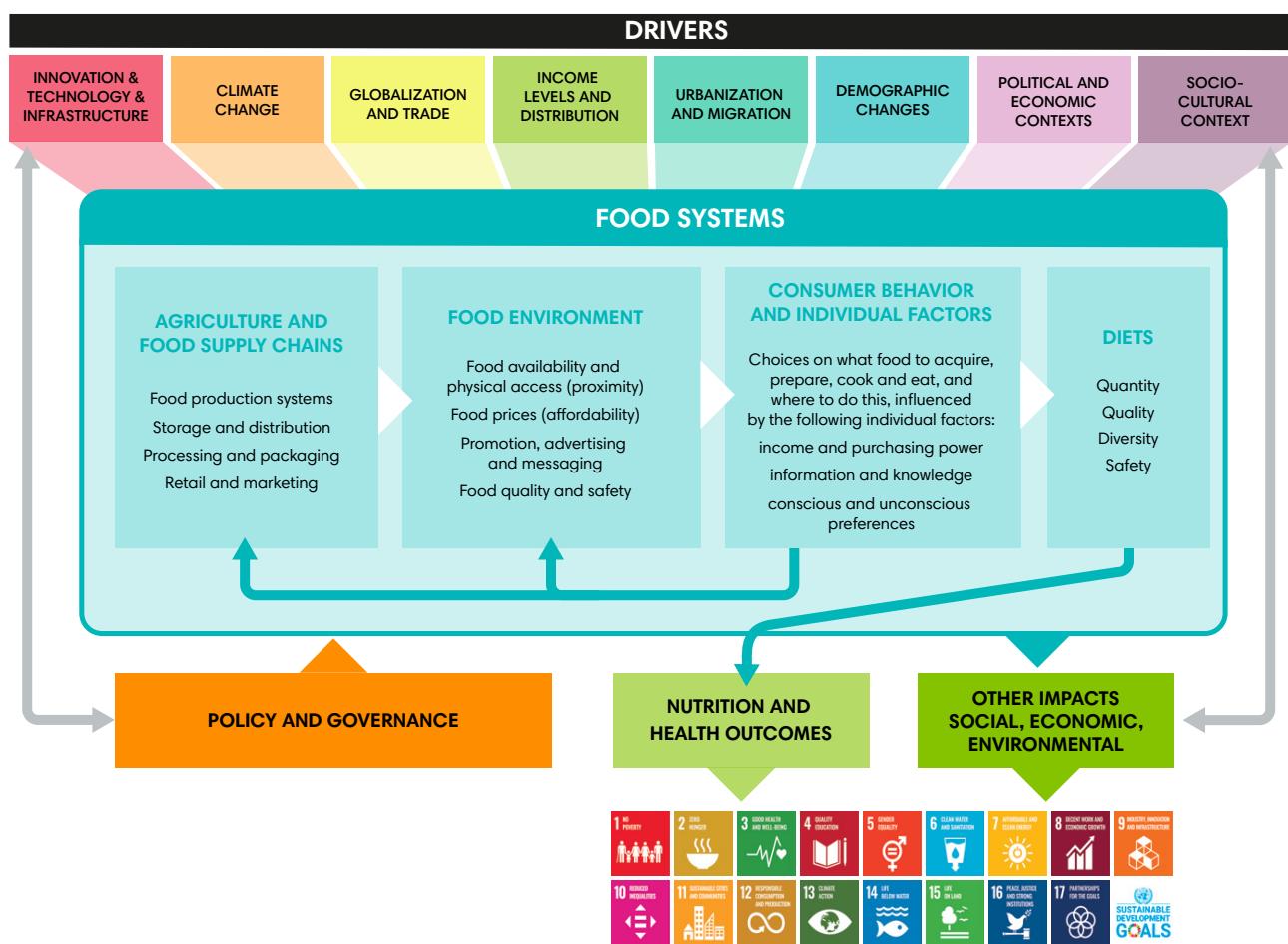


Figure 1. Food Systems for Healthy Diets



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

Concepts and definitions

Food systems approach

A food system encompasses the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, as well as parts of the broader economic, societal and natural environments in which they are embedded (FAO, 2018). The emergence of a broad range of factors and processes that affect existing food systems (e.g. population growth, urbanisation, changes in consumption patterns, climate change and the depletion of natural resources) has required changes to existing food systems. These factors have also resulted in a growing number of challenges, with potentially wide-reaching consequences for the state of food security and nutrition (FSN). To achieve a better understanding of how a diverse range of food systems function, a framework to assess different food systems was developed to ensure that they evolve in such a way that minimises their negative impacts and maximises their positive contributions.

Building on the international political momentum created around nutrition by the 2030 Agenda, the 2014 Rome Declaration on Nutrition and the subsequent UN Decade of Action on Nutrition (2016–2025), the UN's

Committee on World Food Security (CFS), at its 42nd Plenary session in October 2015, requested that the High-Level Panel of Experts on Food Security and Nutrition (HLPE)⁴ prepare a report on nutrition and food systems, to be presented at CFS 44 in October 2017. The conceptual framework developed by the HLPE identified three interacting elements of food systems: (i) food supply chains, (ii) food environments and (iii) consumer behaviour (HLPE, 2017). In particular, the framework highlighted the central role of the food environment in which the consumer engages with the food system in facilitating healthy and sustainable consumer food choices.

The conceptual framework⁵ proposed for this report was based on the following constituent elements and definitions:

Food supply chain. The food supply chain consists of the activities and actors involved in the production and consumption of food and the disposal of its waste (Hawkes and Ruel, 2012). Food supply chains commonly consist of the following stages from a nutrition and diet perspective: (i) production, (ii) storage and distribution, (iii) processing and packaging and (iv) retail and markets.

Food environment. The food environment refers to the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food. Specifically, it consists of: (i) “food entry points”, or the physical spaces where food is purchased or obtained; (ii) features and infrastructure of the built environment that allow consumers to access these spaces; (iii) personal determinants of consumer food choices (including income, education, values, skills, etc.); and (iv) the surrounding political, social and cultural norms that underlie these interactions. The key elements of the food environment that influence consumer food choices, food acceptability and diets are: (i) physical and economic access to food (proximity and affordability); (ii) food promotion, advertising and information; and (iii) food quality and safety (Caspi, Sorensen, Subramanian and Kawachi, 2012; Swinburn & Moore, 2014; Hawkes, 2015).

Consumer behaviour. Consumer behaviour reflects all the choices and decisions made by consumers, at the household or individual level, on what food to acquire, store, prepare, cook and eat, and on the allocation of food within the household (including gender repartition and feeding of children). Behaviour is largely shaped by the existing food environment, which includes personal and collective determinants of consumer food choices (including food prices, income, knowledge and skills, time and equipment, and social and cultural norms).

Diets. Diets comprise the individual foods that a person consumes. Dietary patterns are the quantities, proportions and combinations of different foods and beverages in diets, and the frequency at which they are habitually consumed (Hu, 2002). Dietary patterns interact with food systems, not only as an outcome of existing food systems but also as a driver of change for future food systems. Sustainable diets are those diets characterised by a low environmental impact which contributes to food and nutrition security and a healthy life for present and future generations. Sustainable diets are “protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy, while optimising natural and human resources” (FAO, 2012). Food systems, through diets, give rise to a variety of outcomes. These relate not only to nutrition and health, but also to all aspects of sustainability, which in turn link back to the food system drivers (see below).

Drivers. A driver is an external pressure that effects change. The conceptual framework identified five main categories of drivers of food system changes. These were: (i) biophysical and environmental; (ii) innovation,

⁴ The HLPE is the science-policy interface of the Committee on World Food Security (CFS), which is, at the global level, the foremost inclusive and evidence-based international and intergovernmental platform for food security and nutrition (FSN).

⁵ The framework was adapted from previous reports (Global Panel on Agriculture and Food Systems for Nutrition [GloPan], 2016; Ingram, 2011; Lawrence, Friel, Wingrove, James and Candy, 2015; Pinstrup-Andersen and Watson 2011; and Sobal, Khan and Bisogni, 1998a).

Table 1. Adapted from World Vision's gender equity and social inclusion approach and theory of change

GESI Domain & Guiding Question	Key Food System Domains	Additional questions
Is there equitable and inclusive access?	<ul style="list-style-type: none"> Food supply chains Food environments Consumer behavior 	What policy and program recommendations will support: <ul style="list-style-type: none"> Equitable access Equitable and inclusive decision-making Participation That systems are GESI responsive Well-being of the most vulnerable
Are decisions equitable and inclusive?	<ul style="list-style-type: none"> Food supply chains Consumer behavior 	... to improve dietary, social norm and food security outcomes?
Who is participating?	<ul style="list-style-type: none"> Food supply chains (roles) Food environments (representation) 	
Are systems GESI -responsive?	<ul style="list-style-type: none"> Food supply chains Political, program & institutional actions 	
How do we ensure the well-being of the most vulnerable?	<ul style="list-style-type: none"> Food environments Political, program & institutional actions 	

technology and infrastructure; (iii) political and economic; (iv) socio-cultural and (v) demographic (Ingram, 2011). In recognition of the emerging, covariate effects that COVID-19 has had on each food system domain, COVID-19 has been incorporated as a “sixth driver” of food systems change in developing each guidance note.

Gender and social inclusion. Taking gender and social inclusion into consideration is of critical importance when it comes to more fully understanding the local context and shaping practical policy and programme guidance for mainstreaming nutrition within food sub-sectors. As such, the methodology used for the stakeholder consultation process and each food system domain (see Table 1) was based on the World Vision Gender Equity and Social Inclusion domains of inquiry. These ideas are reflected within the situation analyses, impact pathway descriptions and recommendations included in this guidance note.

Theory of change. A theory of change (TOC) outlines the process of change, identifying causal linkages between short-term, intermediate and long-term outcomes in a project’s design (or a process). A “pathway” shows the logical relationship between the outcomes over time (Taplin and Clark, 2012).

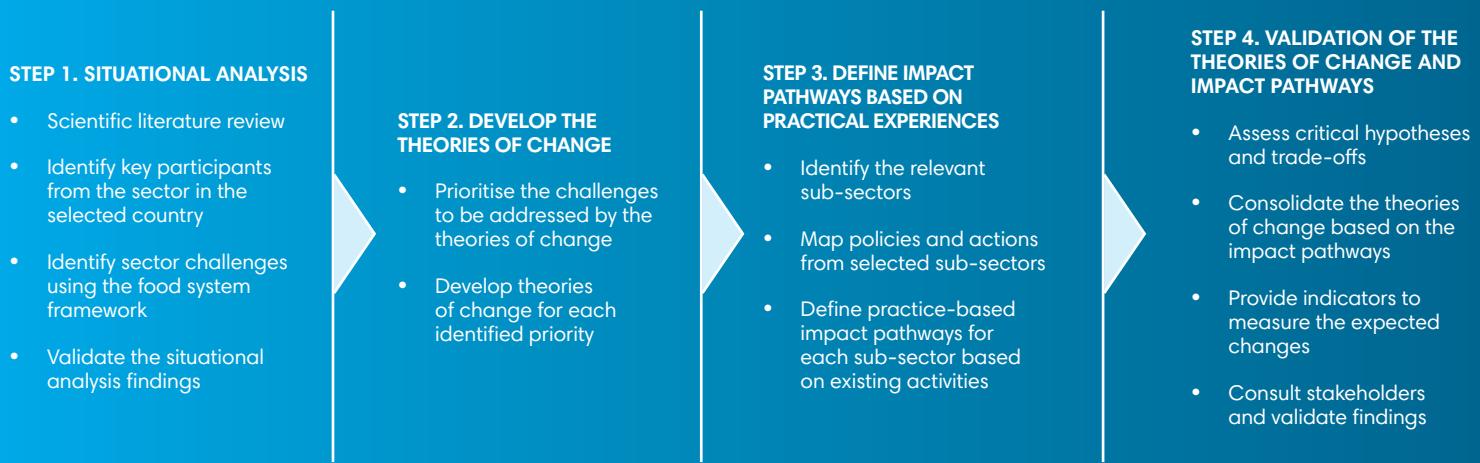
Impact pathways. A pathway map is a sequence of stages between activities (e.g. those involved in a project) and the impact of these activities over time. A theory of change adds to an impact pathway by describing the assumptions behind the links in the pathway.

Underlying assumptions. These are assumptions on what has to happen to enable the expected changes in the impact pathways.

Trade-offs. These are recognised and/or agreed compromises between two or more features, whereby the risks of favouring one option over another have been duly considered in the decision process.



FIGURE 2. THE KEY STEPS OF THE METHODOLOGICAL PROCESS



2. Stepwise approach

Step 1. Situational analysis

The food security and nutrition profile of Kenya

Kenya's population has grown from about eight million people in 1960 to currently around 47.6 million, with an estimated rate of growth of 2.3 percent (Kenya National Bureau of Statistics, 2019).⁶ While infant mortality rates are still high, so are birth rates, and life expectancy has improved in recent years, increasing on average from 48.9 years (2006) to 64 years (2018). The population is young with a current median age of 19.7 years.⁷ The country has experienced rapid urbanisation, and as a proportion of the total population, urban dwellers increased from 8.8 percent (1960–1970) to 20.9 percent (2000–2010) and are projected to exceed 36 percent by 2030–2040.

Kenya's population growth contributes to its problems of poverty and inequality, which are key determinants affecting access to and consumption of natural resources.⁸ Over a third of Kenya's population live in poverty (36.1 percent), with 8.6 percent living in extreme poverty (KNBS, 2019).⁹ Overall, poverty rates are higher in rural areas (40.1 percent) than in the core of urban areas (29.4 percent). The highest poverty rates are in the country's areas of arid and semi-arid land (ASAL), with Turkana County's poverty rate the highest in the country (78 percent). Poverty contributes to people's vulnerability to climate change, as it limits their social and financial options for adaptation (National Environment Management Authority, 2015).

The majority of households (88 percent) in Kenya have acceptable food consumption scores (WFP, 2016). But in terms of numbers, 155 500 households are categorised as poor consumption and 879 000 as borderline consumption households (KNBS, 2010). Based on an average household size of 3.9 individuals, there are an estimated four million food-insecure Kenyans (Kenya Integrated Household Budget Survey, 2018). Rural households, which are typically poor and dependent on daily agricultural labour, are more likely to be food insecure than urban households (14 percent and 9 percent, respectively). Low-income agriculture is the most common type

⁶ In the early 1980s, this had been as high as 3.9 percent.

⁷ See World Population Review website: <https://worldpopulationreview.com>.

⁸ Kenya is a lower-middle-income country, earning USD 1,790 gross national income per capita in 2018 and is one of the low-income food-deficit countries (LIFDCs).

⁹ Although high, the proportion of people living below the poverty line has declined by around 10 percent over the last 10 years, and extreme poverty declined by around 11 percent in the same period.

of livelihood. Compared with food-secure households, food-insecure households have fewer livestock and less agricultural land, and are more likely to be headed by women and the elderly. Nevertheless, while the prevalence of food insecurity is highest in rural counties, the highest number of food insecure households is in the capital Nairobi, where 96 356 households have poor or borderline consumption (WFP, 2016).

In the early 2010s, Kenya's overall protein intake (including animal and vegetal protein) was only 89 percent of the African average and 76 percent of the world average (Obiero, Cai, Abila and Ajayi, 2019). In 2015, about one in every three individuals in Kenya was below the "food poverty" line,¹⁰ 24 percent of the population was undernourished and 26 percent of children under five years of age were stunted (KNBS, 2019). Food-insecure people in Kenya are often the most vulnerable to malnutrition and young children and women of reproductive age are in particular the most vulnerable.

Data collected by the 2014 Kenya Demographic and Health Survey (KDHS) indicated that wasting as a measure of malnutrition was estimated to affect 4.1 percent of children between 6 and 59 months of age – a marked improvement on the 6.7 percent reported in the 2008 KDHS. However, levels were considered "poor" for 6–59-month-olds in the poorest households and households with poor food consumption and those that are reliant on coping strategies, and 'serious' for children whose mothers had no education. Factors found to correlate with a high prevalence of wasting included poverty, poor sanitation and drinking water quality, poor education of the head of the household and underweight women of childbearing age. Low dietary diversity levels were well above average. Stunting as a measure of chronic malnutrition among Kenyan children aged six months to five years was considered 'poor' by WHO thresholds, with 26 percent either moderately or severely stunted, down from 35.3 percent in the 2008 KDHS. Stunting is associated with a number of long-term contributing factors, including chronically inadequate levels of protein and energy intake, micronutrient deficiencies, frequent infection, inappropriate feeding practices over a sustained period and household poverty (WFP, 2016).

SCIENTIFIC LITERATURE REVIEW

The sectoral literature review has been carried out in three steps:

1. Creation of a summary table of the key documents on the fisheries sector and their main findings;
2. Identification of the evidence contained in the scientific literature that explores the impact of the fisheries sector on food security and dietary diversification; and
3. Analysis of the evidence base in the context of the main components of the food systems conceptual framework.

DRAFTING OF SECTOR THEORIES OF CHANGE

Country-level stakeholders define in a consensual manner the main priorities for the sector in order to achieve healthy and diversified diets. This prioritisation process is carried out based on both the literature reviews and the country contextual analyses. The project team explains to country partners how to apply the TOC to the sector using a food systems approach.

In collaboration with partners, in order to address the problem statement(s), nutrition changes are mapped on a theory of change. Ultimately, the TOC makes it possible to identify all the outputs that are needed to achieve the short, medium, and long-term changes.



1. Identify and classify priorities by domain
2. Develop theories of change for each targeted priority
3. Complete and finalise each TOC using working groups composed of country stakeholders



Annex 2: Theory of change graphic

¹⁰ Defined as the lack of financial capacity to maintain food consumption that satisfies adequate daily calorific requirements.

Similar to most countries in Africa, Kenya has a much lower animal protein intake than the world average (Obiero et al., 2019). Milk (i.e. dairy products) accounted for nearly half of the country's animal protein intake, whereas the share of meat was 36 percent (Obiero et al., 2019). However, fish's share of total animal protein intake is much lower in Kenya (less than 10 percent) than in Africa as a whole (20 percent; Cai, 2018). By 2010, this share had declined further to 8 percent; a decline that was reflected in a corresponding decrease in per capita fish consumption from 6.0 kg to 4.3 kg over the same period (Farm Africa, 2016).¹¹ These declines appear at least in part due to the increase in the population growth rate (2.8 percent) during this period. The situation was further exacerbated by the low levels of production at Kenya's coastal fisheries, high levels of exports from Lake Victoria and a lack of infrastructure impeding higher production at Kenya's other lake fisheries.

Overview of the fishery sector in Kenya

Kenya's fishery sector can be divided into five sub-sectors: lake capture fishery, aquaculture (which includes pond and cage culture), coastal marine capture fishery, offshore pelagic fishery and EEZ fishery. In aggregate, the fishing industry contributes about 0.8 percent to Kenya's GDP, with the inland fisheries sub-sector contributing up to 95 percent of this total, followed by the marine fisheries sub-sector at 5 percent (FAO, 2015). The industry employs over 60 000 fishers directly and an estimated 1.2 million people directly and indirectly within the fishing, production and supply chains. The majority of incomes and livelihoods depend on the freshwater lakes,¹² man-made dams and the coastal and deeper water pelagic fisheries

During the period of the country's second Medium Term Plan (MTP; 2014–2018), total fish production declined by 21.3 percent from 163 389 metric tons (MT) in 2013 to 128 645 MT in 2016. The amount of marine fish landed declined by 0.45 percent from 9 136 MT in 2013 to 9 095 MT in 2016. Freshwater fish production dropped by 22.5 percent from 154 253 MT in 2013 to 119 550 MT in 2016. These decreases in production were attributed to shrinking lakes and dams, excessive and unregulated fishing, poor implementation of fishery regulations, climate change, deterioration/degradation of the aquatic environment (due to siltation, pollution, etc.), inadequate fishery infrastructure, use of inappropriate fishing methods, and the presence of the water hyacinth, particularly in Lake Victoria. Total exports in 2018 accounted for approximately 8.8 million MT and were dominated by dried, smoked and salted fish (22 percent), molluscs (16 percent) and Nile Perch and other fish (23 percent). Total imports were an estimated 22 million MT and were dominated by "frozen and other fish" (62 percent) and "tilapia and other fish" (18 percent).

There is a continual structural deficit between consumer demand for fish and domestic production. Capture fisheries and semi-intensive pond-based fish production has not been able to meet demand for fish in Kenya. As a result, imports of fish from the East African Community (EAC) region (mainly Uganda) and China continue to grow (or at least had done so up to the recent COVID-19 pandemic) and are likely placing downward pressure on fish prices (Farm Africa, 2016). With stagnant, even declining, fisheries and a growing population with an increasing appetite for fish, the fish supply gap is likely to increase in the future unless substantial increases in production are achieved by adopting intensive fish production systems in a responsible manner (Obwanga, Soma, Ingasia Ayuya, Rurangwa, van Wonderen, Beekman and Kilelu, 2020).

By 2030, Kenya's population is expected to reach 67 million, which means that the country would need around 270 000 MT of fish to maintain its per capita fish consumption at the same level as in the early 2010s (4 kg/year). Even if Kenya could stabilise its wild fish production at its 2017 level (120 000 MT), farmed fish production

¹¹ This is slightly below the average fish and seafood consumption in the East African Community (4.7 kg/capita/year), sub-Saharan Africa (8.6 kg/capita/year) and worldwide (20.2 kg/capita/year). See Rothuis, Turenhout, van Duijn, Roem, Rurangwa, Katunzi, Shoko and Kabagambe (2014) and FAO (2018).

¹² Victoria, Turkana, Naivasha and Baringo, and the rivers Tana, Athi-Sabaki, Nzoia and Yala.

in the country would need to produce an additional 150 000 MT to meet the projected 2030 demand. Given the country produced 12 000 MT of fish from aquaculture in 2017, a 21 percent annual rate of increase in aquaculture production over the period 2017–2030 would be required in order to achieve 150 000 MT by 2030. To boost its per capita fish consumption to 10 kg/year (the African average in the early 2010s) by 2030, Kenya would need to produce 670 000 MT of fish. Given wild fish production figures of 120 000 MT, farmed fish production would need to increase to 550 000 MT by 2030, requiring a 34 percent annual growth rate in aquaculture over the period 2017–2030 (Obiero et al., 2019).

Despite these challenges, the Kenyan government remains committed to increasing national per capita fish consumption to 10 kg per year, as set out in the Blue Economy Agenda (Kimani et al., 2018). Specifically, under the Exploitation of Living Resources, the main focus is on: (i) investments to develop under-exploited stocks (including the Lake Turkana fisheries, which have an estimated potential of 30 000 MT), (ii) the exclusive economic zone (fish stocks with an estimated potential of between 150 000 and 300 000 MT), (iii) developing the capacity of artisanal fishers, (iv) developing value-added fish products, and (v) implementation and enforcement of fishery regulations to ensure sustainability. Similarly, under the Aquaculture Business Development Programme, investments would be directed towards improving the production and productivity of smallholder farmers' aquaculture value chains and the farmers' FSN, through the establishment of a series of strategic Public-Private-Producer (4Ps) Partnerships.¹³

Kenya's artisanal coastal fisheries sub-sector

A group of national experts was formed at the invitation of World Vision Kenya and FAO's Kenya office to be the stakeholder group responsible for providing input on and reviewing the Kenya Fisheries Guidance Note. After the initial organisational meeting in April 2020, it was decided that the group should be enlarged and diversified. Experts in the group represented the **nutrition, freshwater and marine capture fisheries and aquaculture**, and **policy** sectors. While meetings (by Zoom) were initially scheduled on a bi-weekly basis, due to time constraints these were subsequently increased to weekly meetings. In addition to these group sessions, a number of bilateral meetings were also completed and served as an additional source of information for the preparation of this guidance note. The group agreed to focus on the artisanal coastal fisheries sub-sector as the entry point for the development of this guidance note.

Main characteristics

Artisanal fishers land at least 95 percent of the marine catch in Kenya, with the remaining 5 percent caught by commercial trawlers. The sub-sector represents a significant source of livelihood for coastal communities and supports small-scale fishers, traders and processors, including women, who play a key role in the value chain of landed fishery products. Kenya's demersal fishing capacity consists of some 3 000 small-scale fishing (SSF) crafts and approximately 14 000 fishers (Ministry of Agriculture Livestock and Fisheries, 2016). The SSF sub-sector operates in the inshore waters around coral

¹³ There are currently two major internationally financed projects underway assisting the Kenyan government to meet these targets: the Aquaculture Business Development Programme (IFAD, 2017) and the Marine Fisheries and Socio-Economic Development Project (IDA, 2020). The former supports a number of community nutrition initiatives (CNIs) through a sub-component of the same name in accordance with Kenya's 2017–2014 National Nutrition Action Plan. The implicit theory of change for these CNIs is that engagement with the fish supply chain will have an effect on income and access to nutritious foods for healthy eating, contributing to good nutritional outcomes. Groups of small-scale fish farmers will be engaged on intensified nutrition promotion for increased fish consumption and healthy eating through income impact pathway. In the latter FSN is not explicitly addressed in project design but food supply is expected to benefit through increased HH income resulting from project support for alternative livelihoods. The target beneficiaries would be fishers, poor fishery-dependent households and rural communities in 19 coastal sub-counties with direct or indirect links to fishing activities.





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reefs, mangrove creeks and seagrass beds extending to the outer reef edge (Kimani et al., 2018).¹⁴ Fishing is concentrated in these nearshore areas mainly because local fishers lack the capacity in terms of suitable fishing vessels and gear to venture offshore into deeper waters. Most fishing activities occur during the calmer northeast monsoons. Entry into the SSF sector is open access and not adequately regulated.

Women are found in harvesting, processing, marketing, trading and, on occasion, leadership roles. This makes them a very important source of income within local communities and means they also promote food security to a large number of people. For example, collecting juvenile crabs is an activity carried out by low-income fishers – mainly women and children – who collect crabs to meet subsistence needs (Mirera et al., 2013). In some areas such as Shimoni, women also participate in gleaning for cephalopods on the reef flats during low tide. Fish frying is one method of prolonging shelf life that is common in Kenya and practised by a large number of women along the coast, where fried fish accounts for 68 percent of the value-added fish products.

Over 190 species of finfish representing 49 families have been documented as having been captured as part of Kenya's coastal artisanal catches. The main demersal fish families captured include rabbitfish, emperors, parrotfish, goatfish, surgeonfish, snappers, groupers and sweetlips. Handlines and beach seines capture the highest number of species. Despite the high species diversity, approximately 15–17 species account for over 90 percent of demersal catches, and over 60 percent of the catch is made up of just three species (Hicks and

¹⁴ The main fishing areas include the rich inshore grounds south of the Lamu Archipelago, Malindi-Ungwana Bay, and the North Kenya and Malindi Banks.

McClanahan, 2012; Tuda, Wolff and Breckwoldt, 2016).¹⁵ Juvenile fish also constitute a high proportion (up to 60 percent) of most artisanal catches, suggesting a high probability of overfishing.

Handling methods used by artisanal fishermen are partly determined by the quantity of fish caught, as carrying baskets and gunny bags have limited holding capacity. The first handling of the catch at sea often involves placing the catch in a woven mat, basket or gunny bag, or in the bottom of the boat. These methods expose the fish to the risk of contamination from oil and foreign objects in the boat. During storage, the fish are also exposed to the air and high ambient temperatures for long periods of time (usually between six and ten hours), speeding up the spoiling process(Odoli, Oduor-Odote, Onyango and Ohowa, 2013).

To reduce spoilage upon landing, the principal handling and preservation practices employed by the fishers, traders and processors include: deep-frying (27 percent), icing (24 percent), freezing (20 percent), gutting (4 percent), drying (4 percent), smoking (3 percent), immersion in seawater (2 percent), salting (2 percent) and others (2 percent), while the remainder of the catch is not treated at all (12 percent). Most of the fish from SSF is consumed fresh and locally. The processing and storage of demersal fish depends on channel throughput, and some species and fish products are exported after further processing to domestic and international markets (e.g. shrimp, lobster and cephalopods).^{16,17} Fish handling facilities for artisanal catches have been built at the some 197 landing sites found along the coast, but the accompanying handling and processing infrastructure is limited (MALF, 2016).¹⁸

Most fish produced by SSF is sold locally.¹⁹ People in rural areas of Kenya depend on food purchased directly from neighbours or from kiosks located in the village. Wet markets offer fresh food that in addition to fruits and vegetables also offer other commodities, including fish, whose variety and availability depend on the region, proximity to town and day the market is held (Rischke, Kimenju, Klasen, and Qaim, 2015). Trading centres may also host weekly wet markets on different days at locations that often also accommodate butchers and fast-food restaurants, as well as street food stalls serving foods such as fried fish (Chege, Andersson and Qaim, 2015).

In terms of a food system, Kenya's artisanal fisheries sub-sector is best classified as "traditional", defined as consumer reliance on minimally processed seasonal foods collected or produced for self-consumption or sold mainly through informal markets. Food supply chains are short and local, and access to perishable foods can be limited or seasonal (HLPE, 2017).

¹⁵ These are the rabbitfish (*Siganus sutor*), parrotfish (*Leptoscarus vaigiensis*) and the emperor fish (*Lethrinus lentjan*). See Samoilys et al. (2016).

¹⁶ Four channels have been identified in the sub-sector: artisanal, semi-/non-integrated industrial processed, integrated industrial processed and live fish export. The artisanal fisheries channel is by far the largest in terms of the volumes handled and number of people involved (Karuga and Abila, 2007).

¹⁷ Further up the value chain, absentee boat owners (fishing boat realtors)/traders may preserve fresh fish in ice in traditional baskets or insulated boxes for transportation by road to towns along the coast and sometimes to cities as far inland as Nairobi. The businessmen dealing with sales of fresh fish have moderate investments in the business, including dedicated fish shops with deep freezers to preserve fish and improved sanitary conditions (tiled pavements and flowing water) to maintain high standards.

¹⁸ In 2016 for example, there were only nine landing sites with cold rooms, of which seven were operational for fish and ice storage, only 22 had electricity, 15 had jetties and 28 had fish bandas. Beach management unit (BMU) facilities were scarce, with only 30 landing sites having a BMU office. Landing sites fared better with road connections: 81 had all-weather feeder roads. Mobile phone network connection was available at almost all landing sites (187 out of 197).

¹⁹ Over 95 percent of marine fish landed along the Kenya coast is consumed locally in the fishing villages by the fishers and their HHs, urban household consumers, and hotels and restaurants in the major cities. The upcountry population is not very familiar with, nor expresses much demand for, marine fish (Karuga and Abila, 2007).



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Main challenges

Poverty and food insecurity. Kenya's marginal agricultural communities include remote and pastoralist communities and fishers. In terms of the percentage of poor in Kenya's five coastal counties, this ranges from 29 percent in Mombassa to 66 percent in Tana River (WB, 2019). Tana River and Kwale were categorised as two of the top ten most food insecure counties measured by food consumption score (FCS) and are the most vulnerable to food insecurity (WFP, 2016).²⁰ In these very poor counties where the vast majority of heads of households have little or no education, food security is undermined by high food prices and the lack of adequate cash-generating employment opportunities or other short-term work. **Hypothesis:** To be sustainable, any intervention aimed at increasing SSF's contribution through fish to the food security and nutrition of vulnerable households will have to address the underlying issue and effects of poverty in fisher households (HHs).

In order to address the issue of poverty as a factor contributing to insecurity and poor nutrition in the SSF sub-sector, there is a need to address the input stage of the food supply chain, which at present forces small-scale fishers to sell food in raw or semi-processed states, resulting in significant losses due to discard and spoilage (Mwirigi and Theuri, 2012).²¹ **Hypothesis:** Strengthening the SSF supply chain by increasing inputs into it will result in increases in the supply and value of fish and fish products available to consumers.

²⁰ Both were classed as "unacceptable" with an FCS of 20 percent. In drought-prone Tana River, this was attributed to the effects of drought, poverty and low education levels (some 64 % of households have little or no education). Vitamin A intake is the second lowest in the country. Milk consumption is below average at 3.2 days a week and 18 percent of the population have low dietary diversity. Men work mainly informal jobs in agriculture. Households are highly market dependent, purchasing more than 85 percent of their food days. Kwale has high poverty levels (%54 are in the lowest wealth quintile) and high unemployment among working men. See World Food Programme (2016) for more information.

²¹ Marine species exported to international markets include prawns, octopus, cuttlefish and lobsters, which are semi-processed or packaged whole. While the fish transport system for the local market is poorly developed, the system used to transfer fish to international markets is better organized, with ice and refrigerated trucks and containers along the value chain to meet the required quality standards. Modern processing plants support the value chain for freshwater fish exported to international markets. A lot of work has been done to improve the facilities and equipment at the fish landing sites to bring them up to international standards, but the primary benefits appear to have gone to the exporters and little has been achieved in terms of improving the volume of processed fish products.

Political economy of trading and marketing jeopardising SSF. Once landed by the fisher, the catch, which for the most part is owned by absentee boat owners/fish dealers, is sorted by species, and graded and given a market value by the boat owner/fish dealer. Artisanal fishers are not organised as commercial enterprises and are often paid below market rates by unscrupulous absentee boat owners who command greater access to market information (Karuga and Abila, 2007). The value chain of the fish trade in Kenya has well-established linkages between the actors and operates as a closed system, limiting entry.²² **Hypothesis:** To get added value out of the food supply chain for small-scale fishers, individual fishers will have to organise into larger groups that are supported and empowered by an enabling political environment, in order to be able to compete with the “cartels” operating in Kenya’s SSF sector.

Depleted status of existing traditionally harvested fish stocks. Results from recent stock assessments show that current fishing activities are adversely affecting most of the key commercial species and fishers are experiencing declines in catches. The lack of alternative economic opportunities contributes to a heavy reliance on fishing as a safety net. Despite the challenge of overcapacity in small-scale demersal fisheries, there are limited controls on equipment use and fishing activities.²³ These factors combine to contribute to what is effectively an open-access system. **Hypothesis:** In the short to medium term, it is unlikely that the SSF sub-sector will make any significant incremental contributions to Kenya’s food security and nutrition based on catch from traditionally harvested fish stocks.

Step 2. Develop a theory of change

The basic proposition that informs this guidance note’s theory of change and underlying impact pathways is that that the SSF sub-sector has a potentially important role to play in contributing to both increased FSN outcomes and the longer-term goal of achieving self-sufficiency in meeting the demand for fish through domestic fish production channels. While there does not appear to be much potential for increasing production from traditional fish stocks above existing levels, there may be opportunities in under-exploited fish stocks and/or mariculture. However, to fulfil this potential, fishers must become organised into cooperative-type organizations so they can compete in what is effectively a closed-market system, and support must then be given for the

DRAFTING OF IMPACT PATHWAYS BASED ON PRACTICAL EXPERIENCES

Development of the impact pathways for each sub-sector is a practice-based exercise. The project team carries out a non-exhaustive mapping of the projects and programmes implemented by stakeholders in the targeted country for the fisheries sector. Using the stakeholders’ expertise and project and programme activities as entry points, sub-pathways are then developed and validated by the country stakeholders.

Each sub-pathway gives an overview of the entry points, opportunities and gaps associated with interventions aimed at better integrating nutrition in the fisheries sector. At the end of the exercise, the pathways are combined to form a comprehensive impact pathway.



- Collect information on projects and programmes implemented by country stakeholders
- Define sub-pathways based on the theories of change and the projects and programmes list
- Develop practice-based impact pathways for each identified sub-sector
- Finalise and validate the different sub-pathways with the stakeholders and construct a comprehensive impact pathway

²² It might also be noted that the top fish traders seem to be considered credit-worthy by banks and micro-finance institutions (Karuga and Abila, 2007).

²³ Where there are controls, effective management is undermined by weak enforcement of existing fishery regulations (Kimani et al., 2018).

adoption of a culture leading to the sustainable use of fishery resources. Only then can they benefit from the inputs/activities identified in the three impact pathway analyses.

Step 3. Define the impact pathways

Food supply chain impact pathway

This impact pathway seeks to directly improve the availability of diverse and sustainable fish products from small-scale fisheries, contributing to fishers' increased food security through more equitable income. This in turn is expected to increase their purchasing power, allowing them to access a more healthy and diversified diet. However, the impact on their diets will depend on the accessibility and affordability of nutritious foods the fishers' market environment as well as their own preference and choice on how they spend their additional income. For more detail, see Annex 1 for the impact pathway and Annex 2 for a table of activities, indicators and assumptions.

Food supply chains commonly consist of the following stages: (i) inputs, (ii) production, (iii) process and storage and (iv) marketing and retailing.²⁴

Inputs. The main inputs into small-scale fisheries are human labour (the fishers), the vessel and its operation and maintenance, and equipment and other inputs required to harvest (and handle and process) the resource. The main constraints on sourcing inputs in SSF are their high cost and the limited number of suppliers of inputs in the proximity of most small-scale fishers. The main interventions that could lead to improved working conditions for small-scale fishers include: (i) shifting to appropriate fishing boats and equipment (allowing fisheries to reach less pressured stocks and give existing stocks a chance to recover), (ii) basic infrastructure and facilities (e.g. power/electricity at most landing sites), (iii) cold chain technology (i.e. even just the basic introduction of coolers and improved access to ice), (iv) adoption of appropriate technology to increase shelf life (e.g. drying technology), (v) storage and transportation facilities and equipment (e.g. packing material), and (vi) increased capacity among fishers and the creation of cooperative structures (Karuga and Abila, 2007; Ardjosoediro and Neven, 2008).

Production. The main interventions that could lead to more diversified and sustainable fish production include: (i) research on the presence of nutrient-rich, under-exploited fish stocks; (ii) investments leading to greater access to under-exploited fish stocks; (iii) support for SSF-compatible changes of livelihood within the sector and between sectors, leading to an increase in incomes (e.g. in processing and/or marketing); (iv) promotion and introduction of new and sustainable technologies that target under-exploited ocean species; (v) providing support for more controlled environments (mariculture); and (vi) support for strengthening existing organisational structures or creating new ones, leading to economies of scale and bargaining power in the market place.

Process and storage. Optimal post-harvesting handling preserves the quality and increases the value of the final product. There are a number of interventions to SSF²⁵ that could lead to the improved quality of fish

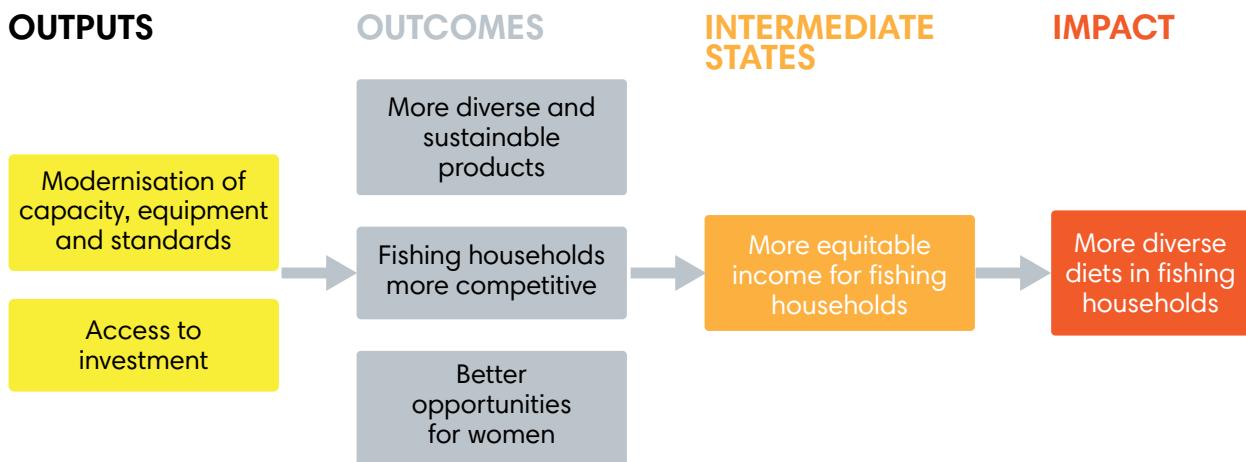
²⁴ The food supply and food environment impact pathways have been divided into well-recognised "stages" of the results chain in Annex 2, under each column, following the HLPE paradigm which have been used to organize the proposed activities/outputs under the different food systems components. In addition to the activities/outputs column, the pathways also show projected short-term (ST), medium-term (MT) and long-term (LT) outcomes over time. For illustrative purposes, the relevant food system components are highlighted for each of the activities/outputs in the text in the boxes under column one.

²⁵ With SSF, an interval of six to ten hours between harvest and landing may restrict the consumption of fresh fish within fishing communities and reduce the fishers' bargaining power and access to better markets further afield. Moreover, fish loss, due to discards and fish viscera and bones (during processing), can be significant.

products and reduced losses. These include: (i) provision of cold-chain technology; (ii) support for improved preservation technologies to replace the traditional frying, smoking and drying of fish would extend shelf life and help reduce loss and waste at small-scale fisheries; and (iii) adoption of new technologies (e.g. vacuum packing, dry canning) to preserve storage life and support value-added processing (e.g. filleting, fixed weight portioning, pre-cooking, assembling, smoking and solar drying; FAO, 2019). Many of these interventions resulting in improved preparation and processing technologies would directly benefit women.

Marketing and retailing. Most fish landed by fishers who don't own their own boats is sold fresh and locally. There are a number of opportunities for facilitating greater access to existing and new markets by establishing cooperatives, professional organizations for the small-scale fisheries sector, and other organisational structures, as well as marketing mechanisms (e.g. auctions). Possible supporting activities include: (i) support for certification programmes and the development of Fish Implementation Plans (FIPs), (ii) promotion campaigns to expand the number of buyers and create links with local and municipal markets and (iii) packaging, branding and labelling (e.g. environmental, regional, ethnic, marketing).

For illustrative purposes, the food supply pathway has been partially mapped below (for more detail see Annexes 1 and 2).



Food environment impact pathway

This impact pathway seeks to directly improve the market accessibility of diverse and safe high-quality fish products from SSF. This in turn is expected to increase and/or be affected by the domestic demand for locally produced (as opposed to imported) fish products, contributing to more equitable income for small-scale fisheries. The impact in terms of the general population's fish consumption will depend on changes in preferences and choices as part of the consumer impact pathway (for more details, see Annexes 1 and 2).

The key elements of the food environment are: (i) physical and financial access to food (proximity and affordability); (ii) food promotion, advertising and information; and (iii) food quality and safety.

Physical and financial access. For the most part, non-boat owners sell fresh fish directly to the consumer, or retailer in the case of the *mama karanga* fish, close to where it is landed. Most do not have their own transport for distributing the fish. Absentee boat owners/providers sell directly to fish dealers, own their own outlets, or transport the catch to urban centres along the coast and sometimes other cities as far inland as Nairobi. Fish markets along the coast tend to be centralised and therefore contribute towards limiting physical access. Similarly, fish access in the hinterlands is often confined to wet markets that are held only on certain days of the week. The same is also true of inland capture fisheries.

Near to the coast, price would appear to be the key determinant affecting the type, amount and seasonality of fish consumption, while in the hinterlands this is likely to be exacerbated by scarcity and access.²⁶ The same also appears to be true of inland fisheries, where prices fluctuate depending on the species, season and supply.²⁷

Food promotion and advertising. The promotion of seafood is rare and information is limited (Chege et al., 2015). There does not appear to be any formal, organised efforts to promote the availability and consumption of artisanal fish or distribution from the fishers and absentee boat owners/dealers. Assuming the food supply chain for small-scale fishers is strengthened, leading to the availability of higher-quality products, this would be a key factor for future development. A second opportunity may lie in the promotion of lower priced fish, which research demonstrates could provide a nutritional value equal to or greater than traditional species.

Food quality and safety. Fish drying is one of the most common traditional fish preservation methods in Kenya, and fish are traditionally dried out in the open on beaches by spreading them directly on the ground or on mats for around 2–5 days, depending on weather conditions. This is not hygienic, since fish, being a high-protein food, is exposed to microbial contamination and thus deterioration of quality or decomposition. It is also exposed to dust particles. This problem is exacerbated in wet and cold weather, where the catch fails to dry and so is easily attacked by bacteria/microbes and thus begins to rot and deteriorates in quality. This in turn represents significant loss of market and income to small-scale fishers. Similarly, fried fish is usually displayed for sale in the evenings by the roadside and market centres in wooden boxes or open trays illuminated by paraffin candles/lamps locally known as *korobois*. This exposes fish to contamination from hydrocarbons and smoke from the candles or kerosene lamps, posing a health hazard, as well as a disincentive for potential clients to buy the fish. The practice of smoking fish is affected by the demand for wood not only in coastal but also inland areas (mostly from mangrove forests) and the health issues associated with smoke. Such conditions are not hygienic and lower the quality of the product (Ofulla, Onyuka, Wagai, Anyona, Dida and Gichuki, 2011; FAO, 1994). Opportunities to improve food presentation in SSF include: (i) use of raised racks, solar driers and hybrid solar driers as improvements on beach-dried fish); (ii) open-ventilated drying racks (Oduor-Odote, Shitanda, Obiero and Kituu, 2010); (iii) improved product packaging for dried fish intended for national retail stores (Cyprian, Nguyen, Sveinsdottir, Jonsson, Tomasson, Thorkelsson and Arason, 2015); (iv) improved smoking ovens leading to higher drying temperatures and thus reducing smoking time compared to the traditional smoking oven; and (v) redesign of the boxes that display the fish and replacement of the kerosene lamps with eco-friendly chargeable solar lamps.²⁸

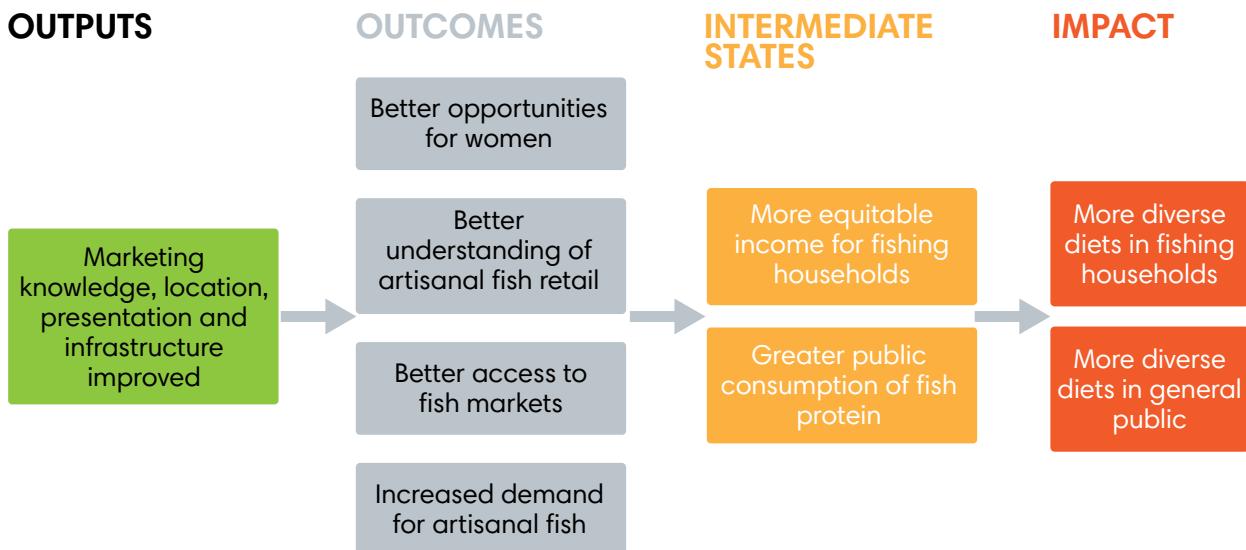
The informal sector in Kenya is the main supplier of food products to the domestic markets, yet they operate in an environment where few systems have been put in place to support food safety and quality control. This has been attributed to a lack of qualified personnel and the infrastructure and equipment necessary for the hygienic storage and handling of food products during production, distribution and retailing, as well as a failure to enforce existing regulations.

²⁶ An analysis of the consumption patterns of different types of proteins in Kenya show that wild-caught fish, followed by pond fish, make up a large proportion of the total protein consumed by respondents from “poor” socio-economic classes. The results further indicated that as households become wealthier, “terrestrial sources of animal protein” (e.g. chicken, beef, mutton and pork) account for increasingly larger shares of total protein consumption. Conversely, as socio-economic status declines, fish plays an increasingly bigger role in a person’s diet. This implies that the poorer the household, the more important fish is to their total protein intake. It was therefore concluded that, although formidable fish supply chain issues remain, many families – including poor families – receive meaningful food security benefits from aquaculture, and presumably also from cheaper imports from China (Obwanga, Soma, Ingasia Ayuya, Rurangwa, van Wonderen, Beekman and Kilelu, 2020).

²⁷ For example, the supply of omena/dagaa (*R. argentea*), one of the most important commercial species and a popular and affordable protein source for the rural and urban population, falls during the full moon, resulting in increased demand and prices.

²⁸ Prototype fish display shelves with these solar lamps were market-tested for acceptability in Kilifi County. The fish traders, usually women known as mama karanga, save between 0.25 and 0.5 litres of kerosene by using the solar lamp and also have more hygienic shelves.

For illustrative purposes, the food environment pathway has been partially mapped below (for more detail, see Annexes 1 and 2).



Consumer behaviour pathway

This impact pathway seeks to directly increase the domestic demand for diverse and safe high-quality fish products that are locally and sustainably produced by SSF. This in turn is expected to affect the consumption of fish in populations beyond the coastal communities, contributing to more diverse diets (for more detail, see Annexes 1 and 2).

Consumer behaviour encompasses all the choices and decisions made by consumers on what food to acquire, store, prepare, cook and eat, and on the allocation of food within the household. Behaviour is largely shaped by the existing food environment, which includes personal and collective determinants of consumer food choices (e.g. food prices, income, knowledge and skills, time and equipment, and social and cultural norms [HLPE, 2017]).

In Kenya's coastal communities, there does not appear to be significant resistance to incorporating marine fish catch into the diet. Culturally, fish have been and continue to be their main source of food, supplemented by farming, livestock, and small and medium enterprises including selling of fish and coconut (Ministry of Agriculture Livestock and Fisheries, 2019). Patterns of fish consumption in inland communities vary depending on the local culture.²⁹ Fish-eating campaigns, however, appear to have contributed to increased acceptance of fish as a source of food and protein (fish is widely available in the hinterland and in the big urban centres such as Nairobi, Mombasa, Nakuru and Eldoret). As a result, there appears to be a potential market for freshly caught marine fish outside of the traditional hotel and restaurant market that remains relatively untapped (Karuga and Abila, 2007).

The policy framework for Kenya's FSN goals was set out in the country's 2011 Food and Nutrition Security Policy (FNSP). To implement the policy, the FNSP was followed by the 2012–2017 National Nutrition Action Plan (NNAP), which is supported by the County Nutrition Action Plans (CNAPs) that are currently in the process of being prepared for each county. These latter plans are intended to be local frameworks whose specifics are to be informed by the Ministry of Health's 2017 National Guidelines for Healthy Diets and Physical Activity (which

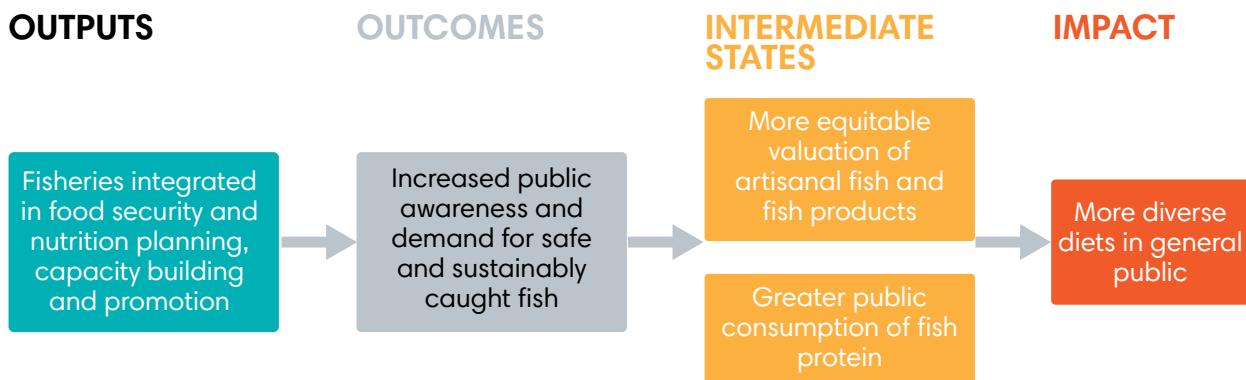
²⁹ For example, most of the communities around the Lake Victoria region have fish as their main source of food supplemented by livestock and crop farming.

explicitly describe and promote the merits of consuming fish as part of a healthy diet), intended to promote healthy eating and active living. It is hoped that the mainstreaming of these guidelines into the CNAPs will encourage dietary shifts and behavioural changes involving the consumption of adequate quantities of fish, resulting in better nutrition and health outcomes across the population. The degree to which these CNAPs and accompanying guidelines are actually able to change consumer behaviour will largely be determined by the degree to which they are supported by county budgets.

How information reaches the consumer (and other actors) is informed by National Guidelines on Kenya's advocacy, communication and social mobilization (ACSM) strategy, which will support the dissemination of healthy diet guidelines among stakeholders at different levels (policy makers, service providers and the community). At a more practical level, there are a number of nutrition education campaigns in Kenya that promote eating more fish. For example, the Eat More Fish Campaign is devoted to teaching non-fish-eating tribes the benefits of eating fish. One of the more successful information dissemination tools is the use of radio to support campaigns led by the respective counties' First Ladies.

While not specific to the fisheries sector, interventions designed to encourage better consumption practices include: (i) education (on dietary diversity, feeding and food preparation, health foods, hygiene) provided through cooperatives, health centres, households, schools, etc.; (ii) advertising to promote behavioural change and support for public awareness campaigns; and (iii) devising and implementation of strategies aimed at influencing what people purchase , including targeted messaging. To varying degrees, these and other efforts are being supported by the existing policy framework, though it does not necessarily specifically target the SSF sub-sector.

For illustrative purposes, the consumer behaviour pathway has been partially mapped below (for more detail, see Annexes 2 and 3).



Key external drivers

Based on the HLPE typology, the main drivers influencing the different elements of the food systems and which could contribute to more diverse diets and nutrition outcomes in the nearshore marine artisanal fisheries sector and beyond were identified as the following (see Annex 4):

Biophysical and environmental. The main threats to Kenya's coastal and marine ecosystems affecting fish stocks are: (i) coastal development and beach erosion, (ii) illegal and unmanaged resource extraction, (iii) poor water and waste management and pollution, (iv) overfishing and destructive fishing practices, (v) damage to the sea floor due to bottom trawling for shrimps and prawns, (vi) climate change, and more recently, (vii) COVID-19.

Increases in sea surface temperature, sea level rise and coastal erosion and acidification associated with climate change are likely to put additional pressure on coastal ecosystems, including islands, estuaries, beaches, coral reefs and marine biodiversity (Ministry of Environment and Forestry, 2018; WB, 2019). Coral reef ecosystems are particularly vulnerable to the effects of climate change, with associated consequences for the livelihoods of millions of people, including small-scale fishers dependent on them for food and income. In the Western Indian Ocean region, corals are already experiencing substantial stress from increasing water temperatures and ocean acidity, with several significant instances of coral bleaching and mortality in recent decades (e.g. 1998). Climate change is very likely to lead to greater numbers of such events and slow the recovery rate of pre-bleaching coral cover, following increasing sea surface temperatures. Furthermore, marine biological invasions are increasingly recognised as a threat to biodiversity. Invasive alien species and harmful algal blooms (HABs) are a current and significant threat to the health of coastal ecosystems that may be climate change related. A number of medium-to-large-scale HABs affecting the northern coasts of East Africa between December 2001 and February 2002 have led to extensive fish mortality in Kenya (Obura, 2002).

The full implications of COVID-19 remain unclear for most countries and are still developing for specific sectors. The main issue that appears most relevant to the coastal fishing community in Kenya is increasing demand for and cost of coastal and inland fish due to declines in imports, particularly from China, though it is not clear how competitive tilapia imports are when compared with coastal fish landings, in particular with respect to consumer demand and price. Arguably, some social distancing measures could be put in place, particularly at landing sites, though the practicality of these would have to be assessed taking into account existing landing and processing practices. Finally, there may be some scope for including basic mitigation measures in the food environment impact pathway which might help increase demand and possibly also the value of fish landed under safer conditions.

Innovation, technology and infrastructure. There are a number of relevant drivers falling under this category that could be of benefit to artisanal fishers. These include: (i) larger, more fuel-efficient fishing boats capable of taking fishers beyond the reefs to access under-exploited stocks safely; (ii) low-impact harvesting technologies and equipment (e.g. to avoid contributing to "ghost fishing"); (iii) potential for mariculture;³⁰ (iv) sustainable technologies that mitigate the effects of climate change and contribute to the value chain and (v) appropriate technologies that assure fish quality and safety while reducing losses.³¹ A key area of research will be determining the presence of under-exploited, nutrient-rich fish stocks (see Annex 5).

³⁰ Due to the falling productivity of nearshore fisheries along the Kenyan coast, mariculture is being considered as the best alternative source of income for coastal artisanal fishing communities, who are not able to exploit the deep-water fisheries due to limited fishing equipment. Potential routes into mariculture include pond culture on land behind mangroves, suspension culture (cage and raft) in sheltered waterways that are of sufficient depth, and rack culture in the shallow intertidal areas (Tychsen, 2006).

³¹ For example, improving the technology for drying fish under all weather conditions (e.g. using solar lamps) will ensure high-quality products, opening up access to high-end national and regional markets.

Political and economic. Major policies that will enable and support interventions in the SSF sub-sector and improved FCS include the blue economy and nutrition priorities included in the economic and social pillars of the government's Third Medium Term Plan 2018–2022 (Government of Kenya, 2018). The process of devolution that began with the 2010 Constitution and devolved power to the counties in some sectors (including fisheries and nutrition) continue to pose challenges to the management of natural resources and other related sectors, such as greater enforcement of human health standards (MALF, 2019). Advocacy is set out by the government's advocacy, communication and social mobilization (ACSM) strategy. Key economic drivers include the price of fish, poverty and economic disparity, and the need to import fish to meet demand, which also appears to be competitive in terms of price and quality.³² Finally, there is considerable interest in encouraging the private sector to invest in fisheries, in particular in the aquaculture sub-sector.

Socio-cultural. Drivers include: (i) growing demand for fresh, safely prepared fish (particularly among the middle class in urban markets); (ii) increasing/diversifying women's role in fish processing and business management (women's, girls' and youth empowerment appears to be growing thanks to education and access to resources and services facilitated by the government, NGOs and International Financial Institutions (IFIs)), building on a long tradition of women playing a significant role in fisher HHs associated with processing and marketing;³³ and (iii) taboos/traditions against eating white meat appear to be breaking down due to changing demographics and urbanisation (see below).

Demographic. The major demographic factors likely to affect the achievement of more diverse diets and nutrition outcomes in coastal communities are population growth, urbanisation and migration. Kenya's population is young with a current median age of 19.7 years.³⁴ The country has experienced rapid urbanisation and as a proportion of the total population, urban dwellers increased from 8.8 percent (1960–1970) to 20.9 percent (2000–2010) and are projected to exceed 36 percent by 2030–2040 (see paragraphs 9–13 above for more detail).

Step 4. Validation of theory of change and impact pathways

Underlying assumptions and trade-offs

A number of assumptions were identified as relevant to the TOC and impact pathways (see Annex 4). The most critical were:

Continued government support for the SSF sub-sector. Perhaps the most critical assumption is that the government will continue to provide support to the SSF sub-sector as outlined in the Blue Economy Agenda under the Exploitation of Living Resources, in particular with respect to support for developing the capacity of artisanal fishers and the development of value-added fish products (see para. 19 above).

³² In only one case examined was nutrition identified as an outcome resulting from increased production at fisheries.

³³ Women play an important part in the fisheries sector, making up nearly half of the total workforce in the sector. However, persistent gender inequalities resulting from fewer educational and training opportunities, societal attitudes and cultural beliefs around gender roles, and a lack of collateral and access to credit, prevent women from fully participating in economic opportunities and decision making. Few women are represented in management positions in organizations such as BMUs. A limited understanding of women's unique roles and contribution to the sub-sector (and broader sector) can result in a lack of recognition of their needs and interests, therefore affecting their full participation in the fisheries value chain, and more broadly, sustainable development outcomes. Women have also been victims of sexual exploitation through the "Jaboya culture", in which sex is traded for fish. With catches decreasing, the trade of sexual favours in exchange for fish has become increasingly prevalent.

³⁴ See World Population Review website: <https://worldpopulationreview.com>.

SSF can compete with the existing cartels. A second critical causal assumption is that small-scale fishers can compete directly with absentee boat owners/fish distributors (either through strengthened BMUs or the creation of a new entity). The “competitive” advantage of small-scale fishers is that they know how to fish, and where and when the fish are present. They however do not have the inputs nor produce the volume of catch needed to sell directly to the local buyers and gain market share. Moreover, even with support to help increase production and/or develop alternative fisheries, it is likely that any incremental benefits would flow directly to the boat owners and cartels. To be able to compete successfully with the existing “cartels” of fish brokers at coastal fisheries, small-scale fishers will require access to the optimal mix of interventions for their fishing facility.

Acceptance of fisher producer-cum-marketing organizations. Following on from the above, a third critical assumption is that coastal fishers would support the creation of a cooperative-type organization (either through the existing BMUs³⁵ or possibly the creation of a new entity). Coastal/inland artisanal fishers' limited organisational and management capacity has been flagged as the most serious constraint to overcome if the SSF sub-sector is going to be able to unlock the benefits of the value chain, starting with gaining access to sources of finance for the purchase of inputs and improved technology (Karuga and Abila, 2007). Most fishers operate as individuals, rather than as a business/brand that will allow them to benefit from economies of scale, develop bargaining power, gain access to finance or lobby the government for their interests.

Health standards. If consumers' confidence and willingness to pay for fresh fish is to be increased, they will need to be convinced that the fish on offer meets with existing national health standards.³⁶ It is assumed that effective monitoring and enforcement of health standards in the less formal markets found along the coast, its adjacent hinterland and near inland fisheries will be achieved together with awareness raising and the education of fishers and fisher HHs on the safe handling and processing of fish and fish products prior to these being offered to the consumer.

CONSOLIDATION OF THE TOCS AND DEFINITION OF MONITORING INDICATORS

The identification of critical hypotheses and trade-offs and the consolidation of the TOC is carried out based on stakeholder discussions and the proposed impact pathways. The connection between the activities and the expected short-term, medium and long-term changes are collectively discussed. Causal links between direct benefits and the activities that are needed in order to achieve the changes are collectively validated. Defining the indicators allows the progress made on nutrition to be monitored and facilitates any necessary adjustments to the proposed interventions.



1. Validation of key assumptions and trade-offs to consolidate the TOCs
2. Definition of key performance indicators

³⁵ A beach management unit (BMU) is a community-level organization of fishers, fish traders, boat owners, fish processors and other stakeholders who traditionally depend on fishery-related activities for their livelihoods. Duties and functions of BMUs are provided for in the 2007 Fisheries (Beach Management Unit) Regulations, which requires a BMU to be established at each site where fish are landed (marine and freshwater). The primary objective of a BMU is to strengthen the management of fish landing stations, fishery resources and the aquatic environment in collaboration with county and national authorities. This includes the collection and management of relevant data and improving fishers' safety at sea. The law also provides for designation of co-management areas (CMAs) and joint co-management areas of marine or freshwater, including fishing grounds, within which BMUs may undertake fishery management activities jointly with the Director of Fisheries and county authorities. Currently, there are 85 BMUs along Kenya's Indian Ocean coast (IDA, 2020).

³⁶ In order to guarantee safe fish and fishery products from source to market, the Kenyan government has put legislation in place. The legal framework covers the entire value chain; however, it appears that for the most part, this framework applies more to the export market, and to a lesser extent the domestic market, particularly outside urban areas and the less formal markets characteristic of the coast and coastal hinterland.



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Support for mainstreaming food security and nutrition policies. Policy continuity will be critical to ensuring that the TOC's medium- and long-term outcomes (impacts) are achieved. At present, there is an enabling framework in place to support FSN goals and objectives in the form of the CNAPs. However, implementing the CNAPs will largely depend on county government priorities and the allocation of county budgets. Currently, much of the CNAP process appears to be being supported by external NGOs and financing agencies. It is assumed that FSN-related policies (including those aimed at increasing fish consumption) will be mainstreamed into county budgets and lead to strengthened health centres, providers and messages.

Other underlying assumptions identified were that: (i) the government will support investment in basic transport and handling and processing infrastructure, as well as research into the presence of under-exploited, nutrient-rich fish species; (ii) the government, NGOs and IFIs will support the scaling-up of successful evidence-based options for intervention; and (iii) regional and consumer HH surveys will document changes in fish/fish product consumption and probabilities for improved nutrition and health outcomes.

A number of **trade-offs** were identified and discussed during the stakeholder consultation process. The most critical were:

Development/diversification of fish production and the coastal environment (food supply pathway). To ensure the future sustainability of small-scale fishers, pressure on traditional, over-exploited stocks will need to be reduced to allow their recovery. This will require a number of conservation measures, including restrictions on equipment, time- and/or area-based restrictions limiting access to stocks, and the creation of marine protected areas (MPAs) to protect breeding grounds in inland water bodies and reservoirs. Critical to these efforts will be the provision of support to fishers to develop under-exploited stocks, mariculture and/or alternative sources of income. Kenya's already degraded coastal and nearshore marine environment and habitats are under increasing threat. In addition to the existing over-exploited fish stock, other pressures on the

environment include the clearing of mangroves, urbanisation, tourism development and expansion, agriculture, manufacturing and processing, transportation, and industrialisation, including mining for sand, and oil and gas exploration (WB, 2019). Growing evidence of the effects attributable to climate change exacerbate an already fragile system (see below).

Poorly planned and managed development in coastal waters involves a certain amount of risk. The government is fully aware of the risks to the fishing environment and has pledged to address these issues by strengthening monitoring capacity and capabilities to prevent overfishing and unauthorised harvesting in the inland waters and EEZ.³⁷ Potential issues associated with food supply-related interventions to promote under-exploited species (changes to the food web) and mariculture (habitat conversion) will have to be mitigated to avoid further adverse impact on the coastal environment. To ensure that any plans to increase the production/diversification of nutrient-rich fish products take environmental considerations into account, FIPs and other certification schemes are recommended to guide their formulation.

Promoting increased climate change resilience among Kenya's coastal fisheries (Food supply pathway). As described above, there is increasing pressure on Kenya's coastal ecosystems and processes from the effects of climate change. This affects both existing fish stocks and habitats and, potentially, future stocks and production systems (e.g. mariculture) that are to be developed under the food supply pathway. In response, the Kenyan government is taking action to increase the adaptive capacity of fisher (and other vulnerable) communities in order to minimise greenhouse gas emissions from their respective production systems. Priority actions include: (i) addressing the overcapacity of artisanal fishing vessels; (ii) rehabilitating and restoring mangrove forests; and (iii) conserving at least 15 percent of coastal and marine areas, especially areas of importance for biodiversity and ecosystem services.³⁸ Other measures to improve the resilience of the fisheries value chain include: (i) supporting risk and vulnerability assessments for the fisheries value chains; (ii) promoting the up-scaling of climate-resilient strategies/ technologies at fisheries and climate-resilient fish varieties; and (iii) expanding fishing zones in both inland and coastal waters.³⁹ These actions could possibly affect the species, habitat, and geographical and physical area accessible to the SSF sub-sector. To ensure harmonisation between the pursuit of climate change resiliency and promotion of alternative sources of nutrient-rich fish products, climate change screening should be included as part of the nutritional assessment of under-exploited species.

Potential adverse social impacts (FE pathway). Likely measures aimed at improving the market accessibility of diverse and safe, high-quality fish products that are to be supported under this pathway may also have a potential adverse social impact. Such impacts may include: (i) the promotion of technologies that some SSF HH members may be unable to sustain (e.g. solar drying), (ii) better located existing markets/new markets may prove logically more difficult to enter, and (iii) producers being unable to respond or negatively responding to increased enforcement of fish consumer health standards. These adverse impacts will be partly mitigated by increased and targeted training, the provision of alternative livelihoods where appropriate, and, with respect to logistical challenges (e.g. transport), addressed by strengthening existing/creating new BMUs (or alternatives), thus helping improve access to capital for investment.

Key findings

Despite Kenya becoming a middle-income country, there are still a significant number of food-insecure Kenyans. Rural households suffer the most from food insecurity. These HHs are typically poor, dependent on

³⁷ See Kenya's National Adaptation Plan (Ministry of Environment and Natural Resources, 2017).

³⁸ See the Kenya Climate Smart Agriculture (CSA) Strategy, 2026–2017 (MALFI, 2017).

³⁹ *Ibid.*

daily agricultural labour, have little livestock and agricultural land, and are more likely to be headed by women and the elderly. Fishers are one of the most vulnerable groups (alongside pastoralists and hunters and gatherers).

Traditionally, fish was less important as a source of animal protein than meat or milk due to a number of factors, including lack of access to fish (for populations not living in close proximity to lakes and the coast), infrastructure constraints (limiting transport to more distant markets) and cultural taboos among some tribes (e.g. preventing the consumption of white meat). This seems to be changing as a result of the development of transport links and markets, urbanisation, changing demographics and government efforts to promote the increased consumption of fish as part of the national FSN strategy. Nevertheless, the share of fish as a percentage of total animal protein remains lower in Kenya than the African average, and has declined in recent years, together with per capita fish consumption. These declines appear at least in part due to the increase in the population growth rate.

Capture fisheries and semi-intensive pond-based fish production have not been able to meet the demand for fish in Kenya. As a result, there is a growing deficit between domestic production and consumer demand, resulting in increasing dependence on frozen fish imports. With stagnant, even declining, contributions from capture fisheries, and a growing population with an increasing appetite for fish, the domestic supply gap is likely to worsen and undermine any future efforts to increase per capita fish consumption, particularly in poorer, more vulnerable communities.

In response, the Kenyan government is working to increase domestic production by capitalising on under-exploited stocks in the country's lakes and reservoirs, expanding access to fish in Kenya's EEZ and increasing the amounts landed there, and building on the country's considerable aquaculture potential, including cage culture.

One of the premises of the food systems approach is that capture fisheries and aquaculture (including mariculture) can make a significant contribution to meeting a country's food security and nutrition needs. This could also potentially be the case for Kenya. However, the amounts produced by the SSF sub-sector have levelled off in recent years, and given the current status of fish stocks, are unlikely to increase significantly for the foreseeable future.

The key to achieving increased production in this sub-sector under the food system impact pathways are activities aimed at: (i) increasing access to alternative fisheries (e.g. providing larger and better-equipped boats to allow the harvesting of under-exploited fish stocks beyond the reef), (ii) investing in research into the presence and nutritional value of the under-exploited small pelagics, and (iii) stepping up production (e.g. through mariculture).

At present, handling methods pose a risk of contamination of the catch and spoilage due to a lack of equipment to preserve fish. Most fish produced by SSF is marketed locally.⁴⁰ Finfish not sold directly to the consumer at the landing site is transported by the absentee boat owners/fish wholesalers to centralised markets along the coast and wet markets located inland. Opportunities to improve the SSF food supply chain include support for: improved landing site infrastructure, cold chain storage, new technologies to preserve storage life, the development of alternative livelihoods compatible with newly formed fish supply chains, value-added processing, increased access to financial services and improvements in food safety and quality standards along the supply chain. The proposed **long-term impact** for the **food supply pathway** is achieving fisheries producing healthy and sustainably harvested fish that help improve the FSN of consumers and socio-economic well-being of fisher HHs (see Annex 2). **Short-term outcomes** include better trained and organised

⁴⁰ Over 95% of marine fish landed along Kenya's coasts is consumed locally in fishing villages by the fishers and their HHs, urban household consumers, and hotels and restaurants in the major cities. The upcountry population is not very familiar with, nor expresses much demand for, marine fish (Karuga and Abila, 2007).



fishers, increased diversity of fish and greater use of under-exploited fish stocks, and increased HH income. The **medium-term outcome** would be the recording of evidence-based interventions demonstrated through an FSA that lead to improved fisher HH incomes, increased consumption of fish protein among Kenya's coastal population and by extension across the country, and sustainable fisheries.

Underlying these activities are the critical causal assumptions that cooperative-type organizations, whether evolving from existing BMUs or newly created, would be welcomed by fishers and, if launched and supported, would prove to be successful in competing in the closed market system that SSF represents in Kenya. Only then can fishers benefit from the inputs/activities identified in the remaining stages of the food system and other two impact pathway analyses by moving up the value chain.

There are also opportunities along the other two impact pathways, and these would appear to lead to an improved impact and improved outcomes for the sub-sector. The SSF **food environment pathway** for is fairly simple and the main beneficiaries would be women and young people. Fishers sell directly to the absentee boat owners/fish distributors, the consumer, or in some cases, the *mama karanga* retailers. Fish purchased by the boat owners/fish wholesalers after landing is retailed at markets located along the coast and, less often, in the hinterland. Price seems to be the main determinant of demand on the coast, and this is compounded by scarcity and lack of diversity in inland markets. In addition, fish is often processed and displayed in an unattractive way. Conditions are often unhygienic and lower the quality of the product. The proposed **long-term impact** for the food environment pathway is improved nutritional status, which is to be achieved by providing greater public access to more diverse, sustainably harvested fish and fish products that benefit the socio-economic well-being of fisher HHs and improve consumer diets. This would be accomplished by supporting research, a series of studies, market decentralisation and/or improved fish displays, the pilot marketing of new fish products,

and training in safety and hygiene for fish handling and processing. Projected **short-term outcomes** include increased demand for safe and sustainably caught, recommended-size/table-size fish and a higher valuation for fish and fish products sold at markets. This in turn would lead to the **intermediate outcome** of increased access to fresh and processed fish that meet food quality standards, and improved consumer diets and HH income for fisher families.

Consumption of fish in coastal counties and their respective hinterlands does not appear to be a problem. However, as elsewhere, there is a need for education and increased public awareness among women of its benefits, particularly for pregnant women and young children. There is also a need to mainstream public health policies into county development plans and budgets, promote greater advocacy and implement the ACSM strategy, and increase awareness through campaigns to encourage the consumption of fish. The proposed **long-term impact** for the **consumer behaviour pathway** is improved health outcomes in Kenyan HHs as a result of the benefits of increased fish consumption, which is to be encouraged through an integrated effort focused on research, planning, education and public awareness. This integrated effort would be achieved through studies and capacity-building activities, and by promoting the mainstreaming of local SSF produced fish consumption into food security and nutrition planning and policies in county development plans, as well as through education (on dietary diversity, feeding and food preparation, health foods, hygiene) through BMUs, cooperatives, health centres, households, schools and local/regional public awareness campaigns. Projected **short-term outcomes** include a strengthened policy and planning environment, increased public awareness of the contribution of fish to HH diets, and greater availability of and demand for highly nutrient fish. This in turn would lead to the **intermediate outcome** of improved HH dietary diversity and micronutrient status.

Unless key elements of Kenya's coastal SSF food supply chain are strengthened, there appears little reason to map out and support efforts directed at the food environment (helping create better food environments targeting both supply of and demand for fish) and consumer behaviour pathways (demand for fish).

Finally, it should be noted that many of these findings also appear relevant to SSF associated with inland capture fisheries.

3. Conclusions and recommendations

The main recommendations are to:

- **Apply an FSA, supported by the three impact pathways, to Kenya's other priority fishery sub-sectors as part of a sector-wide approach.** Kenya is facing significant challenges with regards to meeting its goal of achieving a per capita fish consumption of 10 kg/year by 2030. Its approach is to focus on maximising the potential of aquaculture, inland capture fisheries in the country's lakes and reservoirs, and the EEZ, with the secondary objective being to reduce or eliminate its need to import frozen fish and cheaper sources of protein from abroad. Given the importance that the government has placed on FSN and the fishery sub-sectors, it is recommended that an FSA, supported by the three underlying impact pathways, be applied to these other sub-sectors, using multi-disciplinary teams to assess where opportunities exist to achieve better FSN outcomes.
- **Mainstream FSN initiatives into the design of IFI-supported projects.** The sharp contrast between how International Fund for Agricultural Development (IFAD)- and International Development Association (IDA)-supported fishery projects address FSN issues in Kenya's aquaculture and coastal fisheries sub-sectors, underscores the importance of mainstreaming FSN initiatives into the early stages of the design of projects supported by IFIs. This could be facilitated through advocacy of a joint FSN task force comprised of personnel from the Ministries of Health and Agriculture and Fisheries, which could prove to be a powerful and cost-effective tool for getting the message out to communities and households.
- **Create linkages between the fisheries and nutrition sub-sectors in the preparation of Kenya's CIDPs.** The County Integrated Development Plans (CIDPs) are public plans prepared by all counties in Kenya to guide development over a five-year period. Kenya's Public Finance Management Act dictates that no public funds be appropriated outside a county's planning framework. The CIDP forms the basis for budgeting and the allocation of funds within the county. It also provides a framework for integrating economic, physical, social, environmental and spatial planning. Finally, it is intended to demonstrate how national and devolved government measures will be coordinated for the betterment of the local population. Fisheries as a sub-sector is typically considered part of the agricultural sector, while nutrition typically falls under public health.⁴¹ Given the CIDPs' role in budget allocation and coordination between national and county-supported efforts, there is a need to promote greater linkages between the two sub-sectors in counties' CIDPs and budgets. A pilot effort could be attempted in one or more of Kenya's coastal counties in the next planning cycle.
- **Integrate fish into Kenya's home gardening approach.** Fish as a source of protein at the HH level should be placed in the wider context of a house garden approach which includes family gardens and small ruminants. Other initiatives promoted by the Ministry of Health for which the contributions of fish to FSN could be valuable include: (i) raising awareness among communities on farm planning, production and healthy diets; (ii) promoting the production and consumption of traditional healthy foods; (iii) strengthening and promoting local food processing and preservation to allow sustainable availability; (iv) providing technical guidance on the use of local recipes; (v) providing technical guidance on setting up income-generating activities as a way of promoting food security; and (vi) promoting food diversification.

⁴¹ In only one case examined was nutrition identified as an outcome resulting from increased production at fisheries.

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- **Set up a ecolabeling pilot project.** There appears to be a significant potential for cross-marketing of nutrient-rich fish and fish products that are sustainably harvested. Ecolabelling of products has become an increasingly important factor when it comes to accessing certain markets in the more developed economies. Ecolabels rely on market forces to create incentives in relation to price or access to new markets, and thus provide incentives to adopt better fishing practices. Beginning with one or more interested BMUs, there is an opportunity to support efforts to pilot the ecolabelling of highly nutritious fish harvested sustainably. These efforts would initially target the hotel and restaurant sector on the coast, and could perhaps later be expanded to Nairobi and other inland markets. Such efforts often begin with the formulation of a Fisheries Implementation Plan (FIP) that improves safety and quality to a standard that warrants certification.
 - **Adopt an ecosystem approach to fisheries management.** In addition to the over-exploitation of fish stocks in Kenya's SSF sub-sector, many of these stocks also appear to be increasingly at risk from the adverse impacts of pollution, poorly planned and managed coastal development, and the effects of climate change. As a result, there would seem to be a need for a more comprehensive approach to managing Kenya's coastal fisheries and habitats, with the objective of eventually bringing about their recovery. An ecosystem approach to fisheries management (EAFM) attempts to capitalise on the inter-relationships between fisheries' characteristics and processes and those of their respective ecosystems by taking a more comprehensive approach to the management of natural resources. It is recommended that an EAFM approach, beginning with a pilot activity with one or more interested BMUs, be taken. If successful, this could be linked to the test marketing of certified fish landed under the EAFM regime;
 - **Focus value chain research on the availability and accessibility of healthy food allowing SS fishers to have a healthy diet.** Policy interventions for traditional food systems such as small-scale coastal fisheries should focus on the availability and accessibility of healthy food allowing a healthy diet (e.g. protecting the producer as the one most vulnerable to external shocks that affect production/the purchase of food, infrastructure and storage facilities to allow for safer storage and easier transport, and integrating technologies; HLPE, 2017). Such efforts are typically restricted by the absence of sufficiently disaggregated data on diets for SS fishers. FSN data therefore need to be disaggregated to allow targeting and the evaluation of future development initiatives;
 - **Assess the socio-economic trade-offs.** The FSA includes the concept of social equity, mostly from the perspective of access to food. It also considers the issue of inequitable, dysfunctional food systems and unhealthy food environments affecting low-income consumers, the rural and urban poor, smallholder and subsistence farmers, and indigenous peoples, albeit at a national level rather than at the regional and/or sub-sector levels (HLPE, 2017). However, it doesn't appear to specifically address the issue of the distribution of benefits arising as a result of applying an FSA. It is clear that applying a producer-neutral criterion to the application of an FSA to Kenya's coastal fisheries would likely result in increased FSN outcomes (at least in the short term) and would certainly benefit the absentee boat owners/fish suppliers if not (or to a lesser extent) small-scale fisher HHs. Assessing the trade-offs and how FSA could better take into account social equity issues affecting food producers could prove to be a useful line of research for the future.

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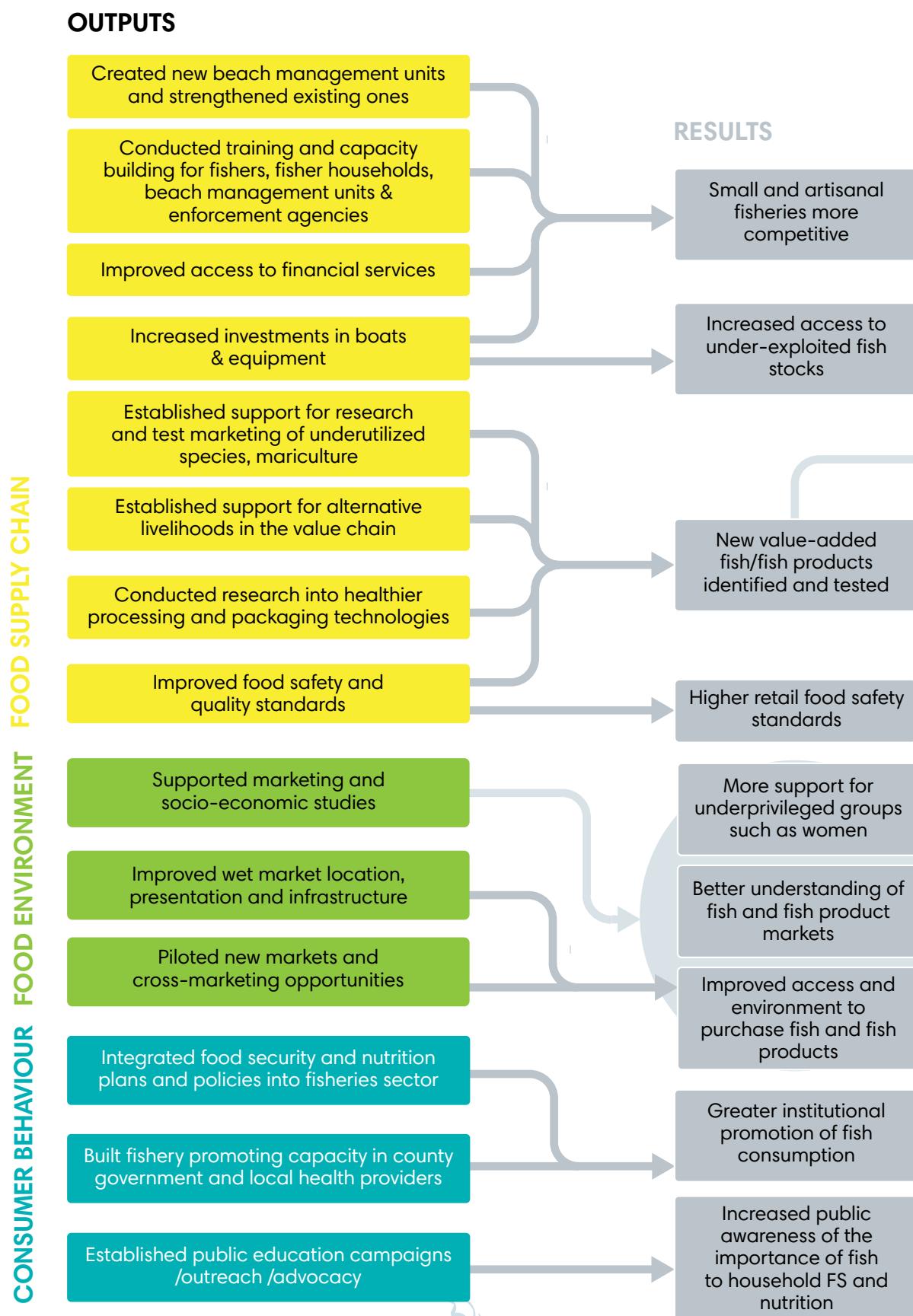
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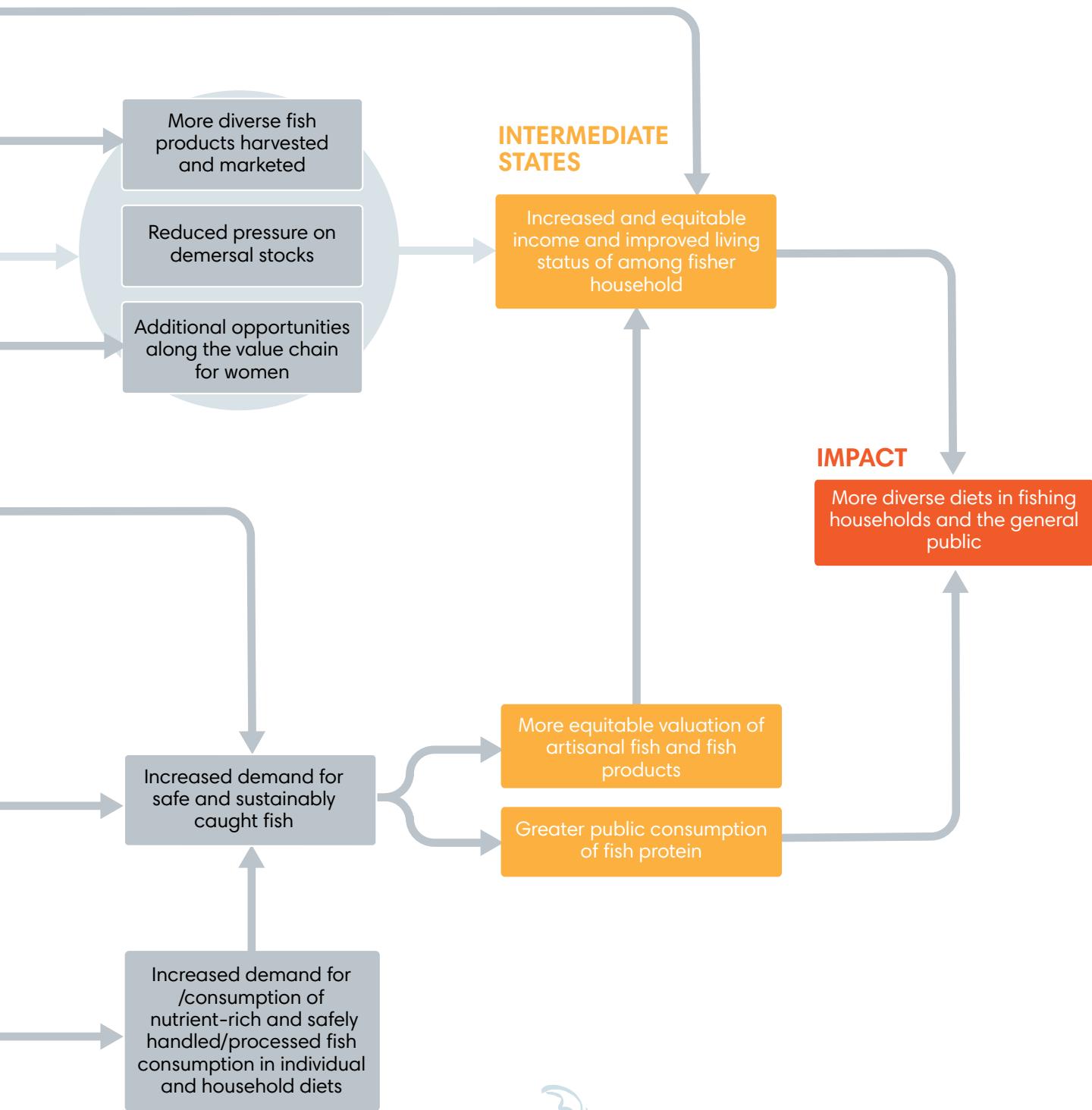
Annexes

Annex 1. Impact pathways for artisanal coastal fisheries in Kenya



To visualize the impact pathway in a two-page view, go to Adobe Reader ribbon and click on View > Page display > Two pages, then check Show Cover Page in Two Pages View.

RESULTS



Annex 2. Impact pathway tables

Table 1a. Impact pathway result chain for Kenya's coastal small-scale artisanal fisheries (food supply)

Key drivers (external pressures that affect change)				
Biophysical and environmental	Innovation, technology and infrastructure	Political and economic	Socio-cultural	Demographic
<ul style="list-style-type: none"> pressure on fish stocks environmental degradation and habitat loss climate change COVID-19 	<ul style="list-style-type: none"> larger, motorised, fuel-efficient craft low-impact fish harvesting technologies mariculture research into under-exploited, highly nutrient-rich fish stocks sustainable technologies that mitigate climate change and contribute to the value chain 	<ul style="list-style-type: none"> poverty, unemployment and economic disparity globalisation and open trade Blue Economy Agenda food, agricultural, nutrition & import policies food prices political advocacy private sector investment 	<ul style="list-style-type: none"> demand for fresh, safely prepared fish increase/diversification of women's and young people's role in the food supply chain taboos/traditions against eating white meat breaking down 	<ul style="list-style-type: none"> population growth urbanisation migration
FOOD SUPPLY CHAIN				
Activities	Outputs	Outcomes (short-term)	Intermediate states (medium-term outcomes = project development objectives)	Impact (long-term outcomes = goals)
<ul style="list-style-type: none"> piloting of new fish products/approaches/markets at household and BMU levels piloting micro- and small-scale processing, leading to additional value to female fish retailers support for research into nutritional properties of under-exploited and/or inappropriately sourced stocks (e.g. highly nutritional fish used as fish feed for aquaculture) increasing institutional capacity to manage and enforce fishery and habitat conservation measures through co-management approaches in cooperation with the BMUs supporting improvements to food safety and quality standards along the supply chain 	<ul style="list-style-type: none"> local certified products based on FIPs in support of under-exploited species (e.g. mud crabs), value-added processing (e.g. filleting) and packaging and/or branding proven demonstration efforts of viable SS fish processing technologies suitable for replication/upscaling profiles of new (or repurposed) target fish species with potential for sustainable development increased number of trained and equipped fishery management staff BMU management plans that adopt sustainable management criteria reduced fish losses at point of capture and landings 	<ul style="list-style-type: none"> households of better equipped and trained fishers organised through BMUs with access to financing and able to unlock the value of fish higher up the value chain increased diversity and production from the harvesting of under-exploited offshore fish stocks reduced pressure on demersal fish stocks greater access to fresh (i.e. healthy) fish for more people increase in household income and purchasing power 	<ul style="list-style-type: none"> evidence-based options demonstrated using an FS approach that lead to improved fisher HH income, increased consumption of fish protein among Kenya's coastal population and sustainable fisheries <p>Indicators</p> <ul style="list-style-type: none"> number of proven interventions 	<ul style="list-style-type: none"> achieving healthy and sustainably harvested fisheries that contribute to improved FSN for consumers diets and socio-economic well-being of fisher households.
INDICATORS				
			<p>Indicators</p> <ul style="list-style-type: none"> number of fishers who are boat owners/fish dealers increased landings of under-exploited species increases in catch per unit of fishing effort and diversity in fish stocks household income 	

Table 1b. Impact pathway result chain for Kenya's coastal small-scale artisanal fisheries (food environment)

FOOD ENVIRONMENT				
Activities	Outputs	Outcomes (short-term)	Intermediate states (medium-term outcomes = project development objectives)	Impact (long-term outcomes = goals)
<ul style="list-style-type: none"> supporting market study for artisanal coastal fisheries socio-economic assessment of who buys what products and financial accessibility introduction of testing and promotion of higher-quality cooking oils among the <i>mama karanga</i> retailers study and provision of incentives leading to voluntary re-location of stalls into more consumer-friendly locales (e.g. wet markets with good lighting, away from of busy roads, etc.) establishing links with local and municipal markets selling fish produce to promote dietary merits of fish protein training handlers and retailers on safety and hygiene practices relating to the handling and processing of fish project design and investment leading to improved presentation of semi-processed fish cost benefit analysis and test marketing in other built environments (e.g. kiosks, inland wet markets) piloting of cross-marketing events between the fish and other sectors 	<ul style="list-style-type: none"> marketing studies and assessments adoption of more healthy oils in the processing and consumption of fish products new/modified stalls leading to increased demand for fish products increased demand for and space allocated to fish at local markets increased number of workers qualified to handle and process fish reduced spoilage reduced health risk to consumers from eating spoiled fish new/modified stalls used by <i>mama karanga</i> (including displays, lighting, etc.) new fish outlets created in other non-traditional food markets events linking Kenya's coastal fishers with the country's tourism industry (e.g. Friday night fish cookouts organised through BMUs at suitable landing sites) 	<ul style="list-style-type: none"> improved understanding of existing/potential markets and obstacles to introducing new fish & fish products increased compliance of artisanal fish products with food safety standards greater access to fish in formal markets (including fish-scarce markets located in the hinterland) increased demand for healthy fresh and processed fish sold directly by fisher HHs increase in HH income and improved living standards of women as a result of greater diversity of alternative livelihoods associated with fish livelihoods 	<p>Indicators</p> <ul style="list-style-type: none"> increase in % of average diet made up of fish frequency of individual/HH fish consumption per week HH income <p>Indicators</p> <ul style="list-style-type: none"> number of stalls and other market outlets for fisher HHs and BMUs that meet safety standards number of informal stalls relocated to formal markets number of new stalls offering fish at inland markets HH income 	<ul style="list-style-type: none"> increased access to fresh and processed fish that meets food-quality standards, leading to improved consumer diets and increased HH income for fisher families <p>Indicators</p> <ul style="list-style-type: none"> increase in % of average diet made up of fish frequency of individual/HH fish consumption per week HH income <ul style="list-style-type: none"> increased diversity of diets made up of a greater proportion of fish, to be achieved by providing greater access to more diverse, sustainably harvested fish and fish products that benefit the socio-economic well-being of fisher HHs and improve consumer diets

Table 1c. Impact pathway result chain for Kenya's coastal small-scale artisanal fisheries (consumer behaviour)

CONSUMER BEHAVIOUR				
Activities	Outputs	Outcomes (short-term)	Intermediate states (medium-term outcomes = project development objectives)	Impact (long-term outcomes = goals)
<ul style="list-style-type: none"> • supply chain analysis • training of staff in county governments and local health centres with a view to incorporating fish into family-based nutritional and dietary planning based on Kenya's Food-Based Dietary Guidelines • incorporate fisheries and fish consumption into FSN planning and policies as part of county development plans • provision of education (on dietary diversity, feeding and food preparation, health foods, hygiene) through BMUs, cooperatives, health centres, households, schools, etc • supporting local/ regional campaigns using advertising and public awareness programmes to promote behavioural change to increased consumption of fish • supporting improved education and advocacy in order to encourage behavioural change • identification and promotion of appropriate technologies, leading to higher-quality and safer products • work with community retailers to adopt, brand and promote products that meet local hygiene standards 	<ul style="list-style-type: none"> • studies and analyses • increased number and capacity of local health workers with an understanding of the role of fish in nutrition • increased visibility and budget for projects that support fish consumption in county development plans • increased awareness among rural populations of the importance of dietary diversity and the contribution fish makes to a good diet • changes in education materials (both formal and informal) to reflect the importance of fish in good diets • viable technologies developed and adopted by fishers and fish mongers (e.g. use of raised fish racks replacing beach drying of fish) • increased number and diversity of fish products available at local markets that have been certified as meeting standards 	<ul style="list-style-type: none"> • strengthened enabling policy & planning environment • strengthened/diversified curricula at educational institutes support FSN strategies related to fish • increased public awareness of the importance of fish to HH FSN • increased support for the promotion of HH/individual fish consumption • increased availability of and demand for highly nutrient fish in markets • improvements in dietary diversity and micronutrient intake and bioavailability as a result of increased fish consumption • improvement in women's knowledge of nutrition 	<p>Indicators</p> <ul style="list-style-type: none"> • nutritional status among target populations • reproductive performance <p>Indicators</p> <ul style="list-style-type: none"> • county government and healthcare staff trained in diet nutrition • county plans that explicitly promote fish as an input into FSN activities • dietary intake profiles 	<ul style="list-style-type: none"> • improved dietary diversity and micronutrient intake due to increased and more diverse fish consumption • improved FSM outcomes in Kenyan HHs due to the benefits of increased fish consumption, promoted through an integrated effort focused on research, planning, education and public awareness

CAUSAL ASSUMPTIONS

(what has to happen in order for the links in the impact pathways happen)

- fishers will support shifts in focus within pilot BMUs from co-management to producer cooperative
- government will support critical infrastructure needs (e.g. road improvement, more decentralised markets)
- the existence of under-exploited fish stocks that are a source of improved protein
- consumers' willingness to accept non-traditional fish and fish products in their diets and pay a premium for "safe", certified and well-presented fish and fish products
- strengthened BMUs with access to finance, technical assistance and training which will be able to compete with existing fish brokers
- county government in cooperation with BMUs will monitor and enforce fishery management regulations
- national and county governments will maintain policy and budgetary support for promoting increased FSN
- increases in fisher HH income will be re-invested in the fishing value chain
- government, NGOs and donors will support scaling-up of successful evidence-based options
- HH and regional surveys will be able to demonstrate the increased consumption of fish and fish products and its translation into improved health outcomes

Annex 3. Kenya's fisheries: Research priorities and information gaps

Research priorities

- a study of fish consumption among those without a tradition of eating fish (especially in rural communities), leading to the development of specific advocacy tools targeting rural communities and household members in non-fish-eating communities;
- a comparative study to document whether fish consumption is better among children living in or in proximity to Kenya's fish-eating areas than it is among those living in non-fish-eating areas, and whether this is comparable to findings) that could prove useful for developing advocacy tools likewise increasing support for the fish sector; in other sub-Saharan Africa (SSA) countries (e.g. Malawi)
- an analysis of the nutritional value of the main fish species eaten in Kenya (e.g. Omena, *Tilapia*) which would provide the scientific basis for promoting their consumption and help with branding/marketing; and
- research into Scombrotoxin (histamine) poisoning caused by failure to chill fish following capture, which poses a health risk to consumers.

Knowledge gaps

- degree of representation and influence of fishers in the national and county FNS coordination forums;
- profile and budget of fisheries under the FNS section of Kenya's current strategic and development plans;
- trade information, supply, production, distribution and utilisation and consumption patterns for Kenya's main fish species;
- how to increase the contribution of fish (in particular the cheap and small fishes such as Omena/sardines) to achieving dietary diversity;
- significance and costs associated with fish protein flight (in Kenya most fish produced is not consumed locally but sold in urban centres);
- significance of the effect of losses on the food system and means of reducing the amount of fish lost due to spoilage, which could be used to feed vulnerable groups (e.g. refugee camps);
- defining components of an inclusive business model for Kenya's fisheries sector that would lead to increased food availability, access and well-being for small-scale producers;
- better understanding of the extent to which inland fisheries support livelihoods, food security and sustainable development in Kenya, in particular among its vulnerable groups;
- better understanding of the role played by fisheries and its importance in Kenya's national development;
- the magnitude of illegal, unregulated and unreported fishing in Kenya's fisheries sector and its role in leading to depleted stocks and loss of livelihood; and
- a post-devolution assessment of the performance of the fisheries sector in supporting Kenya's FNS.



Annex 4. Calendar of meetings of the stakeholder group (Zoom)

DATE	THEME	OBSERVATIONS
22/4/2020	(Introductory meeting (expectations, dates & process	
30/6/2020	Meeting on situational analysis (reviewed process (timeline, Section C proposed outcomes	i) The original deadline for the literature review of the first week of July was too short and it was agreed that this should be postponed to 15 July. (ii) Outcomes and barriers were to be tackled after the lit. review was completed. (iii) There was a need to expand the stakeholder group
14/7/2020	Meeting on problem prioritisation (focus on (aquaculture sector	
30/07/2020	Meeting returned to situational analysis due to lack of inputs to fill out section C	Due to time constraints, it was agreed meetings should be increased to a weekly basis
6/8/2020	Meeting returned to problem prioritisation (intended focus was on capture fisheries but more discussion on (cage culture	It was agreed that TOC would be sent out to stakeholders for input before the next meeting scheduled on Thursday 13 August 2020
13/8/2020	Meeting focused on validation of TOC and related impact pathways	Two graphics - a draft TOC and impact pathways - supported by a more detailed table were sent out two days prior to the stakeholder meeting. Comments were received in edit mode and by email. Further observations were made during the meeting itself, in particular in relation to the focus on SSF, the social equity issue characteristic of SSF in Kenya, and FSN outcomes and terminology that were subsequently reflected in the next draft of the guidance note



For more information check also:



Maximizing nutrition in the fisheries and aquaculture using a food systems approach

An evidence-based literature review

www.fao.org/documents/card/en/c/cb5566en



Maximizing nutrition in the fisheries and aquaculture sector in Kenya

In brief

www.fao.org/documents/card/en/c/cb5604en

To access to all the publications on maximizing nutrition, go to:
www.fao.org/nutrition/policies-programmes

