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BRIEF SERIES | 18

Transitions to Sustainable, Resilient and Equitable Fisheries and Aquaculture in Africa

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SUMMARY

Africa faces a triple burden of malnutrition driven by food insecurity, unhealthy diets and systemic inequities. Fisheries are vital for food security and employment, yet marginalised communities – including indigenous fishers – often face exclusion from tenure rights and policy-making. In Nigeria, small-scale fishers struggle with environmental degradation, tenure conflicts and weak governance. Oil pollution in the Niger Delta has devastated communities, while illegal fishing costs the country US$70 million annually. Gender disparities persist, with women fishers restricted to nearshore waters, limiting their economic opportunities. Strengthening tenure rights, enforcing environmental regulations and ensuring participatory governance can address these challenges. In Kenya and Uganda, grassroots efforts promote equitable access to fishery resources. Initiatives such as the Kenya Climate Smart Agriculture Projects (KCSAP) and the Uganda Climate Smart Agricultural Transformation Project (UCSATP) integrate resilience into fisheries, supporting small-scale producers and local markets. These efforts will enhance food and nutrition security for millions in East Africa. To promote equity in fisheries governance, policies must enhance participation of marginalised groups, including women, in decision-making, promote sustainable practices that balance production with fair distribution and address resource conflicts through better monitoring of illegal fishing and pollution. Africa's fisheries have the potential to drive economic growth under frameworks like the Blue Economy and the African Continental Free Trade Area (AfCFTA). The AfCFTA can reduce import dependency – currently at US$6 billion annually – by fostering regional trade and improving market access for small-scale fishers. Investments in infrastructure, digital monitoring and sustainable practices can help redirect billions to local economies while ensuring marginalised communities benefit. Post-harvest losses remain a major challenge, exacerbated by inadequate cold storage and poor handling. Solutions include investing in cold-chain infrastructure, improving processing techniques and providing training to fishers. Integrating indigenous knowledge – such as that in respect of seasonal closures and mangrove replanting – with modern innovations can enhance sustainability and resilience. By combining equity-focused policies with climate-smart technologies, Africa's fisheries sector can become a powerful engine for food security, economic growth and social inclusion.

Fisheries are vital for food security and employment, yet marginalised communities – including indigenous fishers – often face exclusion from tenure rights and policy-making

INTRODUCTION

Africa faces a triple burden of malnutrition – undernutrition, micronutrient deficiencies and overnutrition – driven by hunger, food insecurity and consumption of unhealthy diets. The region is off track to meet global food security goals, while its fisheries and aquaculture sector, despite vast resources, contributes only 6% of global fish production. This low output fuels a US$6 billion annual reliance on imports, thereby worsening trade deficits and undermining local fisheries.

Africa faces a triple burden of malnutrition driven by hunger, food insecurity and consumption of unhealthy diets

Unlocking the sector's potential requires policy reforms, investments and sustainable practices. The AfCFTA offers a transformative solution by enhancing regional integration, reducing import dependency and fostering a single market for 1.7 billion people, with projected consumer spending of US$6.7 trillion by 2030.

Post-harvest losses: Challenges and solutions

With spoilage rates as high as 30%, post-harvest losses remain a major challenge due to inadequate infrastructure and inefficient handling. Solutions include:

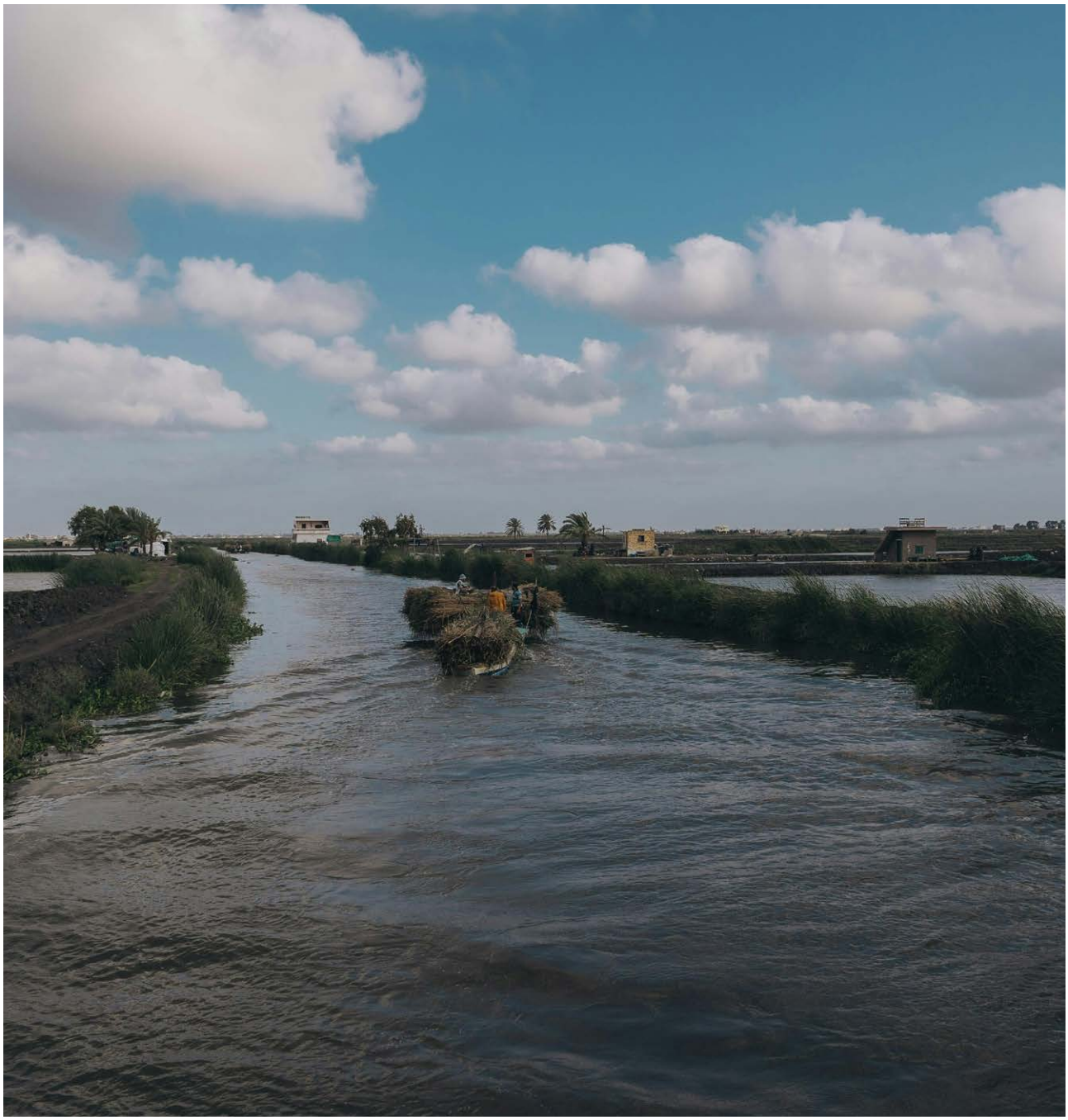
- Cold-chain infrastructure – solar-powered freezers and insulated transport reduce spoilage;
- Energy-efficient processing – smoking, drying and vacuum packaging extend shelf life; and
- Digital tools – supply-chain tracking apps optimise logistics and reduce waste.

Indigenous knowledge also plays a critical role in sustainability. Seasonal fishing closures in Kenya's Lake Victoria region align with breeding cycles, while Nigerian coastal communities use mangrove replanting to sustain fish habitats. Integrating these traditional practices with modern innovations, such as climate-resilient aquaculture systems, can enhance productivity and ecosystem conservation.

AfCFTA's role in transforming fisheries

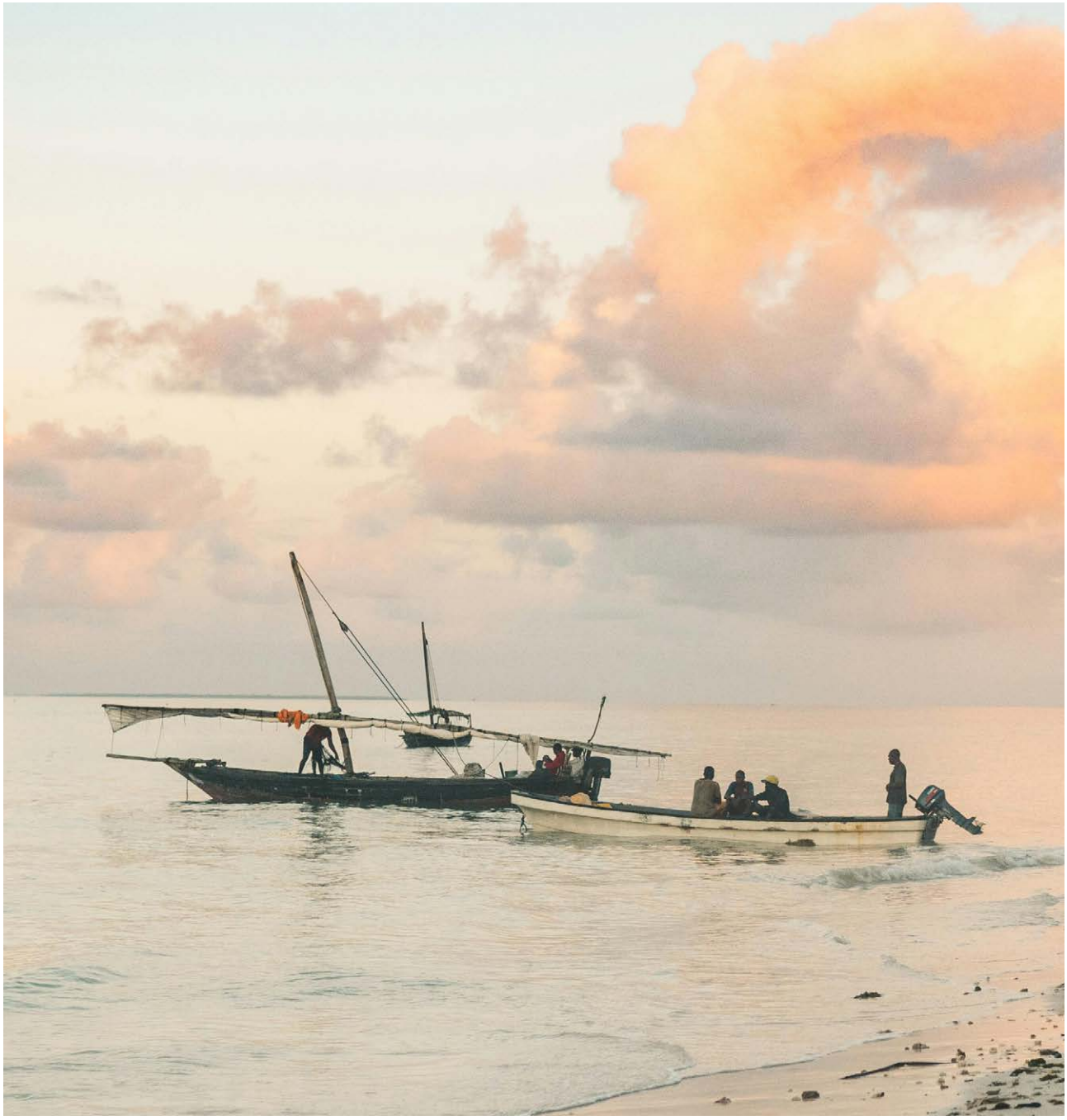
The role of AfCFTA in transforming fisheries involves, among others:

- Boosting intra-African trade: Lower tariffs and harmonised standards promote cross-border trade in processed fish, benefiting enterprises like Uganda's Kati Farms, which exports to 13 African countries.
- Promoting equity: AfCFTA's Women and Youth Economic Empowerment in Fisheries initiative targets 250 000 jobs by 2030 and US$100 million in annual investments in fishery value chains.
- Enhancing sustainability: AfCFTA's environmental policies align trade with marine conservation to prevent overexploitation. By integrating regional trade policies with sustainable fisheries management, Africa can reduce import dependency, boost food security and create inclusive economic opportunities.



MOTIVATION

This brief aims to promote agroecological, climate-resilient and nutrition-sensitive approaches in fisheries and aquaculture. It focuses on enhancing capacities, informing policies and fostering innovation for sustainable industry growth. Key questions include: a) how can sustainable fish production align with agroecological practices in order to build climate resilience and boost food security and incomes? b) What strategies can address demand, affordability, safety and accessibility to ensure fish contribute to healthy diets? c) How can sustainable fish consumption and value-added products be increased and maintained among rural and urban consumers?



CONTEXT

Fish production, post-harvest technologies, marketing and consumption

Fish production in Kenya, Uganda and Nigeria

Aquaculture is the fastest-growing food sector globally, supplying over 50% of the fish consumed worldwide. In Africa, aquaculture is expanding at an 8.1% growth rate, improving food security and income generation. Egypt, Nigeria, Ghana and Uganda lead in production, mainly cultivating Nile tilapia, African catfish, oysters, shrimp and seaweed. The industry is technology-driven, supported by private-sector initiatives and research. Despite East Africa's abundant water resources, fish consumption remains low at 4.8kg per capita compared with the Food and Agriculture Organization's (FAO) recommended 20kg.

In Kenya, freshwater-capture fisheries contribute 80% of total fish production, with Nile perch, Nile tilapia, African catfish and silver cyprinid being the primary species. However, the sector faces challenges such as low technology adoption, lack of value addition and poor infrastructure. To maintain its already low per capita fish consumption, farmed fish production must reach 150 000 tonnes by 2030, or 550 000

FIGURE 1A: BIOFLOC TECHNOLOGY IN KENYA

FIGURE 1B: EARTHEN PONDS

FIGURE 1C: WOODEN RAISED POND

FIGURE 1D: HIGH-DENSITY POLYETHYLENE (HDPE) CAGE

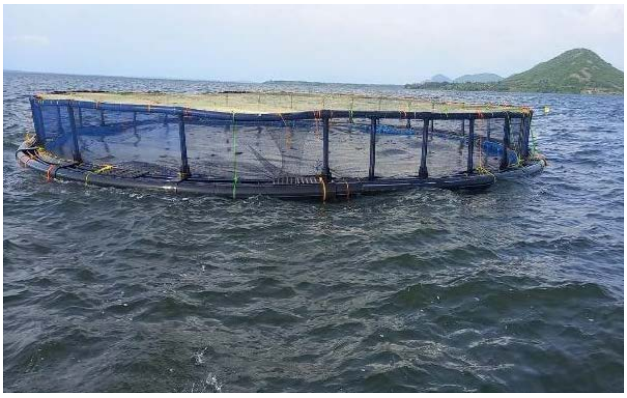


FIGURE 1E: AQUAPONIC SYSTEM (INTEGRATED AQUACULTURE/HYDROPONICS)

FIGURE 1F: INTEGRATED FISH–POULTRY CULTURE SYSTEM

tonnes to match the African average. Additionally, fish diseases threaten aquaculture profitability, necessitating investments in research, disease management and improved fish-health practices. Kenya's National Agroecology for Food System Transformation Strategy (2024–2033) aims to enhance coordination in transforming food and agricultural systems sustainably.

Uganda, a leading aquaculture producer, holds vast freshwater resources, contributing over 1.2% to its gross domestic product (GDP) and generating US$134.8 million in revenue. However, fish production has stagnated at 561 065 tonnes annually due to overfishing and increasing consumer demand. To meet the target of 1.7 million tonnes by 2030, Uganda must scale aquaculture production, aiming for one million tonnes from fish farming alone. The sector provides livelihoods for 2.6 million people, yet women account for less than 20% of its labour force. Market development for farmed fish remains weak, with challenges in technology access, market profitability and consumer demand for fresh, safe fish products.

Uganda's per capita fish consumption is 9.8kg, below the United Nations-recommended 17kg. Despite being a major producer, Uganda imported US$13 million worth of fish in 2019 to meet rising demand. Fish-feed imports, mainly from Israel, Egypt and Brazil, cost an estimated US$108–126 million annually. To address this, Uganda's government promotes an import substitution strategy, encouraging local fish-feed and product manufacturing to enhance national production and reduce foreign exchange expenditure. Strengthening aquaculture investment will support food security, economic growth and sustainable fisheries management in the region.

Aquaculture in Uganda is dominated by Nile tilapia and African catfish farmed mainly by smallholders using pond and cage systems. However, fish populations face threats from diseases due to unregulated live-fish transportation and inadequate health screening systems. These challenges impact food security and livelihoods of farmers, particularly women and youth, who depend on the fishery resources.

Strengthening aquaculture investment will support food security, economic growth and sustainable fisheries management in the region

In Nigeria, aquaculture has expanded to meet local demand, with catfish being the most farmed species. Despite producing over 300 000 metric tonnes annually, Nigeria still imports fish due to high production costs, weak enforcement and environmental challenges. The government promotes sustainable practices like integrated fish farming and local feed production, while international collaborations support sector growth. However, Nigeria lags behind Egypt in adopting advanced aquaculture technologies.

FIGURE 2: CATFISH PRODUCTION IN NIGERIA

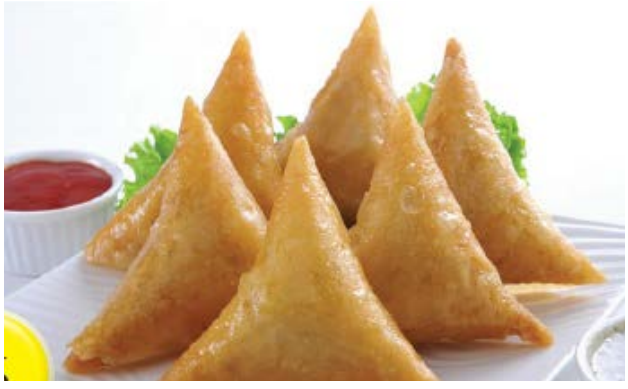
Fish post-harvest technologies and value addition

Fish is highly perishable and Kenya's fisheries sector faces significant post-harvest losses due to inadequate cold-chain infrastructure, limited electricity and insufficient value-addition facilities. These losses reduce fishers' incomes and hinder processing industries from producing high-value products like dried and smoked fish, fish-based fertilisers and fish oil. While solar driers, smoking kilns and cold storage have been introduced, adoption remains slow. Poor infrastructure at landing sites exacerbates spoilage, highlighting the need for climate-smart solutions like solar-powered refrigeration. Strengthening value chains through technology and training can transform losses into economic gains, boosting food security and industry resilience.

FIGURE 3: POST-HARVEST TECHNOLOGIES AND VALUE-ADDED FISH PRODUCTS VALIDATED DURING THE KENYA CLIMATE SMART AGRICULTURE PROJECT, 2019–2022

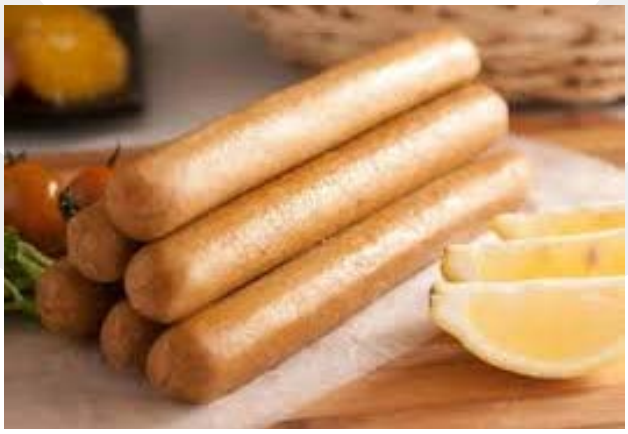
SMOKING KILN

IMPROVED FISH DISPLAY SHELF



FISH SAMOSAS

FISH BALLS



FISH SAUSAGES

FISH FINGERS

Uganda loses about 30% of fish post-harvest, costing about US$21.76 million. Traditional processing methods expose fish to pathogens and polycyclic aromatic hydrocarbons (PAHs), posing health risks. The National Agricultural Research Organization's (NARO) PAH Safe Fish Smoking Kiln reduces PAHs, thus ensuring safety.

FIGURE 4A: SHALDAG LTD USING RECIRCULATING AQUACULTURE SYSTEM (RAS) TECHNOLOGY

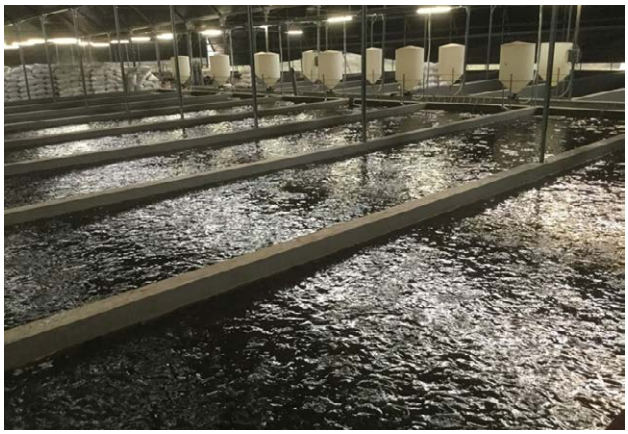


FIGURE 4B: MECHANICAL AND HYGIENIC SMOKING KILN

FIGURE 4C: NIGERIAN CATFISH-SMOKING PROCESS

Fish marketing

In Kenya, the Kenya Fish Marketing Authority, established under the Fisheries Management and Development Act, 2016, oversees fish marketing to enhance production and consumption. Recognising the role of traded fish in combating child malnutrition, the authority has intensified efforts to improve market access and distribution, particularly in coastal regions (Omukoto et al. 2024).

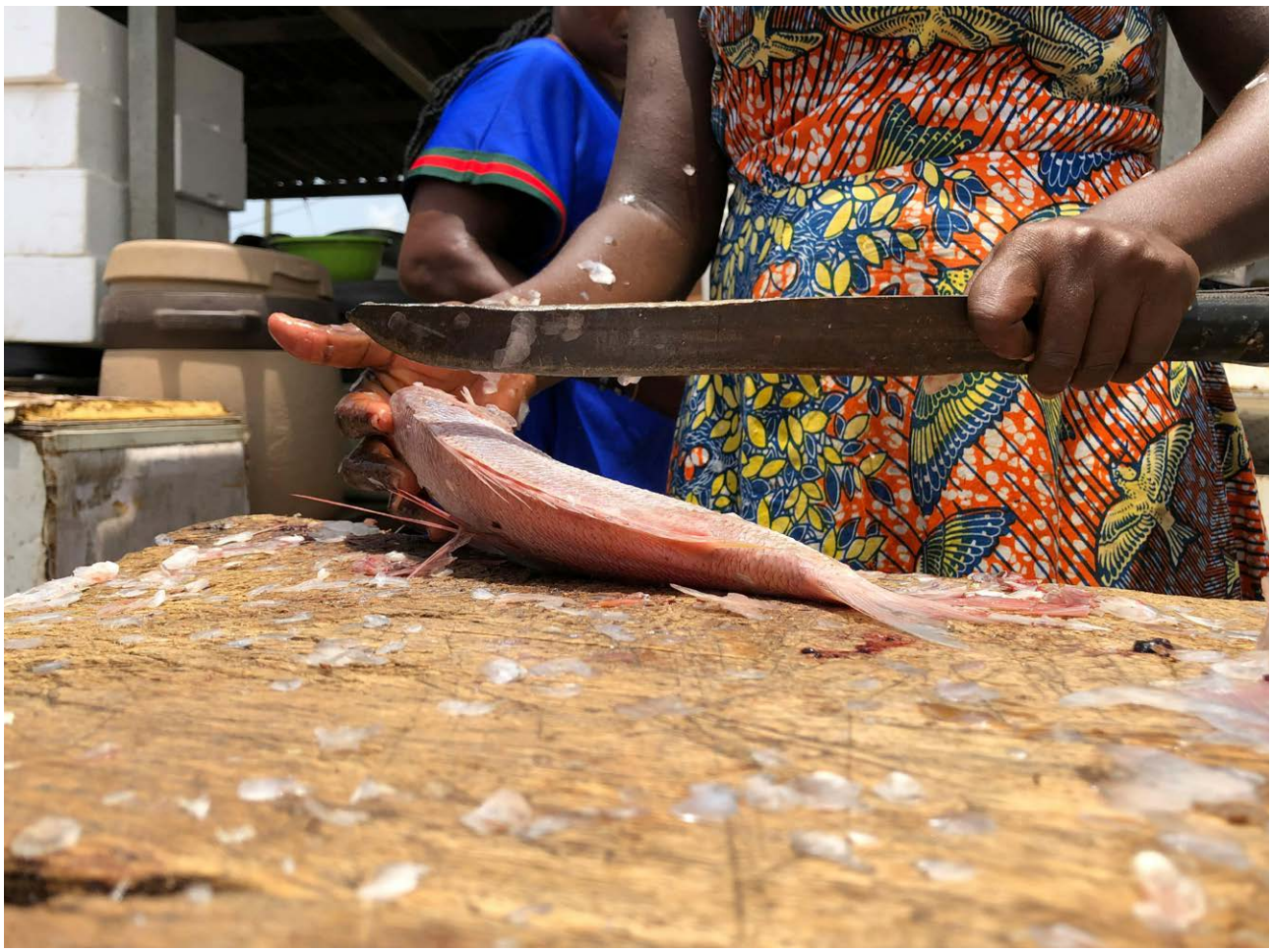
In Nigeria, fisheries and aquaculture supply over 40% of the population's animal protein

In Nigeria, fisheries and aquaculture supply over 40% of the population's animal protein, yet fish marketing remains informal and dominated by small-scale traders with minimal regulation. Challenges like poor infrastructure, high marketing costs and competition from imports hinder profitability. Strengthening infrastructure, financing and market information could improve efficiency and access to higher-value markets.

Fish consumption in Kenya, Uganda and Nigeria

Fish plays a crucial role in food security in Kenya, Uganda and Nigeria. In Kenya and Uganda, per capita fish consumption is about 2.5kg/year and 10kg/year, respectively. Nile tilapia is the most consumed species, followed by Nile perch, silver cyprinid and catfish. Low consumption is due to high prices, limited nutritional awareness and poor preparation skills. Increasing demand for tilapia and Nile perch presents investment opportunities, while nationwide campaigns and nutrition education can boost intake.

Uganda has East Africa's highest fish consumption at 9.8kg/year but still falls short of the FAO's 20kg/year recommendation. Rapid population growth may further reduce per capita intake by 2030. In Nigeria, fish provides 40% of animal protein, with catfish, tilapia and mackerel being the most popular. Local production meets only a third of the 3.6 million-tonne demand, leading to heavy reliance on imports. Urban consumers prefer fresh fish, while rural areas depend on smoked fish.



FISHERIES AND AQUACULTURE IN RELATION TO BROADER FOOD SYSTEM TRANSITIONS IN AFRICA

Expanding sustainable aquaculture in Africa can ease pressure on wild stocks, support biodiversity and build resilient food systems. Technological innovations, such as mobile platforms and water-quality sensors, improve market access and efficiency. Despite challenges like environmental degradation, high costs and weak institutional support, the sector shows promise through sustainable practices, government backing and international partnerships.

Key levers currently receiving philanthropic attention and support

In Nigeria, philanthropic funding and aid strategies for fisheries and aquaculture focus on capacity-building, infrastructure and market access, particularly for small-scale producers, women and youth. Key initiatives include the United States Agency for International Development-funded partnership with Partners for Development and the West Africa Trade and Investment Hub, providing co-investment funding to enhance productivity, infrastructure and sustainable practices in the Niger Delta. Similarly, the Aquaculture Development Project in Nigeria (ADPN), led by Solidaridad and funded by Danida, supports over 1 300 fish farmers in Ogun State by promoting sustainable practices and by offering digital farm management tools, technical support and access to open marketplaces. These programmes help farmers to adopt modern techniques, meet quality standards and form cooperatives for economic growth and resilience.

Research funding comes from international organisations like the Gates Foundation, the FAO, the World Bank's West Africa Coastal Areas Management Program (WACA) and the African Development Bank's (AfDB) Technologies for African Agricultural Transformation (TAAT) initiative, focusing on sustainable aquaculture and post-harvest technologies. Nationally, the Federal Ministry of Agriculture and Rural Development (FMARD) funds local institutions like the Nigerian Institute for Oceanography and Marine Research (NIOMR), though budgets are limited. Transition funding also supports sustainable practices, with the Gates Foundation and WorldFish conducting studies to identify sector bottlenecks, emphasising income generation, dietary diversification and women's empowerment. Programmes like Nigerian Fish Futures further aim to boost fish production while addressing rural socio-economic challenges.

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RECOMMENDATIONS TO PROMOTE TRANSITIONS

A low-cost RAS as well as aquaponics using recycled materials can support small-scale farmers, while hybrid fish farming enhances climate resilience. Solar-powered cold storage and improved energy-efficient kilns help reduce post-harvest losses. Micro-leasing programmes and feed subsidies lower production costs, while gender-responsive grants and participatory certification promote equity. Skills hubs and cooperative infrastructure improve training and resource sharing. These initiatives could cut post-harvest losses to 15%, reduce feed costs by US$200/tonne and boost smallholder adoption of climate-smart practices by 40% in five years.

Modern aquaculture technologies like aquaponics, black soldier fly (BSF) farming and RASs enhance food production and resource use. Women and youth participation is vital for sector growth. Key innovations such as cold-chain systems and improved smoking kilns reduce spoilage and improve quality, though high costs and limited infrastructure hinder adoption. Solutions include microfinancing, government incentives and cooperatives. Sustainable practices like BSF farming reduce fishmeal reliance, but RAS water pollution needs better management. Value-added fish products and aquaculture feed offer income opportunities, though technical expertise and processing facilities remain challenges for broader industry adoption. Scalability of improved technologies requires practical strategies such as community-led processing hubs, decentralised, solar-powered cold storage and training programmes to equip fishers with the necessary skills. Digital technologies, including satellite imagery, drones and underwater cameras, enhance fisheries management by preventing illegal fishing and protecting ecosystems. Radio frequency identification (RFID) and block chain improve traceability, while Big Data Analytics guide sustainable harvesting practices. Automated systems, such as smart feeders and water-quality sensors, further boost aquaculture productivity. Additionally, e-commerce platforms and mobile apps empower fishers by bypassing traditional supply chains, thereby increasing profitability and market reach. Addressing adoption barriers while ensuring environmental sustainability will drive long-term growth and resilience in the sector.

CASE STUDIES

Climate-smart agriculture technologies (CSA-TIMPs) are revolutionising aquaculture in East Africa and Nigeria. In Kenya, innovations like biofloc systems, HDPE fish cages, and BSF feed enhance sustainability. An Aquaculture Information Management System (AQUAMIS) and value-added products improve market access. Uganda's innovation platforms foster collaboration, while infused-phage fish products extend shelf life. In Nigeria, Osky Catfish produces value-added products and trains farmers, while Platinum Fisheries' RAS boosted production from 5 to 390 tonnes. These technologies promote sustainability, resilience and gender responsiveness, ensuring aquaculture's growth and adaptability amid challenges like climate change, disease and market fluctuations.

FIGURE 5: FISH SAUSAGE MADE WITH CATFISH FROM OSKY FARMS IN NIGERIA

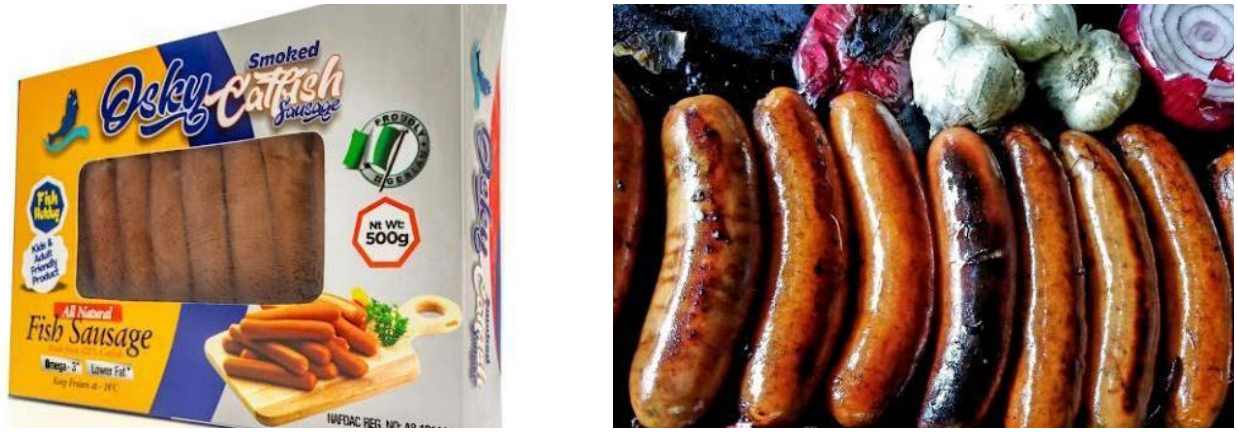
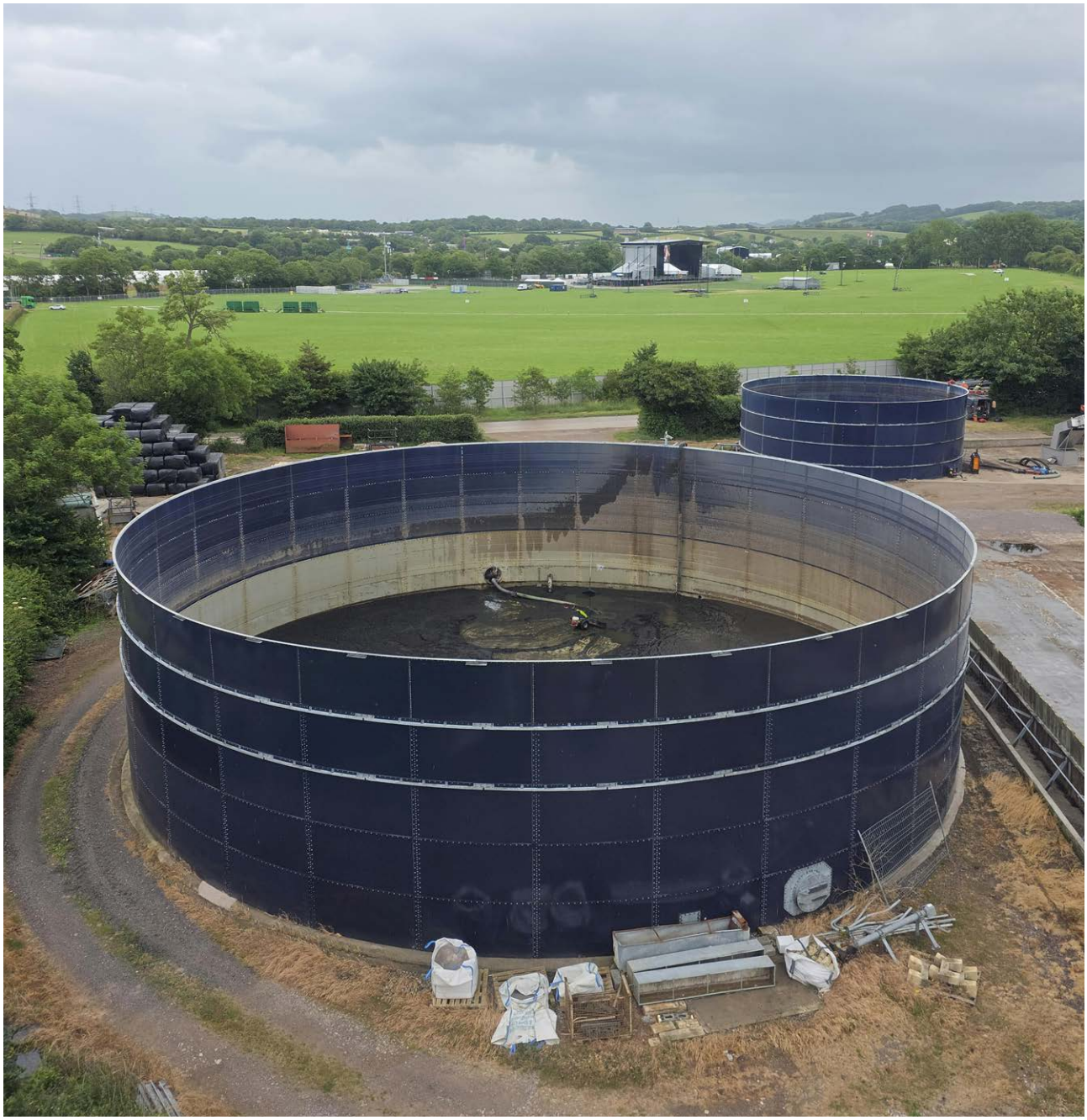


FIGURE 6: PLATINUM FISHERIES AIMS TO DEPLOY MODULAR RAS TECHNOLOGY IN THE NEAR FUTURE

KNOWLEDGE CO-PRODUCTION APPROACH

The cluster in this approach comprises experts from diverse fields such as food and nutrition, fisheries, aquaculture, aquatic science, economics and human resource. The aim is to promote a co-production approach by linking interdisciplinary researchers, experts and networks in the fisheries and aquaculture industry. The approach aims to provide a comprehensive understanding of the cluster, identify issues and propose sustainable interventions. The co-production approach involves engaging all stakeholders along the value chain, including fish farmers, feed suppliers, wholesalers, retailers, processors and consumers.



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FURTHER READING

https://www.oskygroup.com/osky-catfish-sausage/

https://www.instagram.com/p/CvMnpU_tkGn/?utm_source=ig_web_copy_link&igsh=MzRlODBiNWFlZA%3D%3D

https://www.instagram.com/platinumfishng/p/CvMnpU_tkGn/?img_index=1

https://www.perplexity.ai/search/review-the-summary-below-to-re-oQtaF1vWTwu4d7xGr4FUuQ?1=r&4=r&5=r

REFERENCES

Adebayo OT & Dada FO (2020) Aquaculture development in Nigeria: Challenges and prospects. *Journal of Aquatic Sciences* 35(1): 15–23

Ajayi O & Olomola A (2020) Sustainable fisheries management in Nigeria. *African Journal of Marine Science*

Awuor FJ, Macharia IN & Mulwa RM (2023). Adoption and intensity of integrated agriculture aquaculture among smallholder fish farmers in Kenya. *Frontiers in Sustainable Food Systems* 7:1181502

Ayinla OA (2007) Analysis of feeds and feeding practices in aquaculture in Nigeria. FAO Fisheries Report. pp 83–92

Cheserek M, Obiero K & Ogelo E (2021) Eat more fish: Samudra Report. Available at: **https://www.researchgate.net/publication/366669809_Eat_More_Fish**

Cheserek et al. (2022) Fish and fish products consumption behaviours and attitudes of farmers in Western Kenya. *Afr. J Food, Agric, Nutr. Dev.* 114:21503-2152

Diyzee K et al. (2022) Performance analysis of existing catfish and tilapia value chains and market systems in Nigeria: A post-farmgate value chain scoping study. Available at: **https://cgspace.cgiar.org/items/1a380797-c4ad-42a8-8ac4-ac269dd8f556**

Fisheries and Aquaculture Circular No. 1245. Rome: FAO

FAO (2019) Fisheries and aquaculture country profile: Nigeria. FAO

FAO, AUC, ECA & WFP (2023) Africa – regional overview of food security and nutrition 2023: Statistics and trends. Accra. Available at: **https://doi.org/10.4060/cc8743en**

FAO (2024) The state of world fisheries and aquaculture 2024. Available at: **https://www.fao.org/publications/home/fao-flagship-publications/the-state-of-world-fisheries-and-aquaculture**

HLPE (2019) Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. Available at: **https://www.fao.org/agroecology/database/detail/en/c/1242141/**

International Food Policy Research Institute (2024) 2024 global food policy report: Food systems for healthy diets and nutrition. Washington, DC: International Food Policy Research Institute. Available at: **https://hdl.handle.net/10568/141760**

Keyombe JLA, Bironga HC, Obiero MO, Malala JO, Olilo CO, Aura CM et al. (2018) Monitoring the effectiveness of interventions of solar polyethylene dryer in reducing post-harvest losses in lake Turkana and share the findings. Mombasa: Kenya Marine and Fisheries Research Institute. 2018 Report No.: KMF/RS/2018/C2.1(i)

Marigu J, Oduor-Odote P, Odoli C , Ruwa R , Achieng R & Omega M. A preliminary assessment of the post-harvest fish losses along selected fish supply chains in Kwale County, Kenya. *Kenya Aquatica Journal* 8(1): 6–28

Mboya JB et al. (2023) Factors influencing farmed fish traders' intention to use improved fish post-harvest technologies in Kenya: Application of technology acceptance model. *Fisheries and Aquatic Sciences* 26(2): 105–116

Ministry of Agriculture and Livestock Development. The National Agroecology for Food System Transformation Strategy, 2024–2033. Draft Six

Munguti J et al. (2024) Fish diseases and fish health investment needs for aquaculture sector in Kenya: Fish health investment needs in Kenya. *Sustainable Aquatic Research* 3(2): 136–46

Munguti JM et al. (2023) Role of multilateral development organizations, public and private investments in aquaculture subsector in Kenya. *Frontiers in Sustainable Food Systems* 7: 1208918

Obiero K, Cai J, Abilac, R & Ajayib O (2019) High aquaculture growth needed to improve food security and nutrition. Policy brief. FAO/IFAD

Odioko E et al. (2022) The economic analysis of the Nigerian fisheries sector: A review. *Journal of Anatolian Environmental and Animal Sciences* 7(2): 216–226

Omukoto JO, Graham NA & Hicks CC (2024a) Fish contributions toward nutritional security in Kenya. *Food Security* 11:1–21

Omukoto JO, Graham NA & Hicks CC (2024b) Fish markets facilitate nutrition security in coastal Kenya: Empirical evidence for policy leveraging. *Marine Policy* 164: 106179

Pokupec D, Lešnik T & Borec A (2024) Agroecology principles in aquaculture: A case study of East Africa. *Journal of Central European Agriculture* 25(3): 800–806

The 2022 Global Nutrition Report. Available at: **https://globalnutritionreport.org/reports/2022-global-nutrition-report/**

Van Anrooy R et al. (2022) Assessment of fisheries innovations for investment and financing in Kenya. FAO

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