

Sustainability of the Sub-Saharan African Capture Fisheries and Aquaculture Value Chains: A Review of the Roles and Challenges of Youths and Women in Ethiopia, Kenya, Malawi and Zambia.

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ABSTRACT

Women's and youths' participation in capture fisheries and aquaculture value chains is critical to attaining food security and enhancing socio-economic development in sub-Saharan African countries (SSA). Capture fisheries and small-holder aquaculture in Africa significantly impact the livelihoods of households involved in the processing and marketing of fish products, despite many impeding factors in the respective value chains. This paper reviews the challenges that limit women's and youths' full participation in the capture fisheries and aquaculture value chains in selected low-income African countries — Ethiopia, Kenya, Malawi, and Zambia. Electronic data from published literature on case studies in these selected countries was systematically obtained using search engines and reviewed. Analysis showed that many women and youths are employed at all stages of the fish value chains, including production, processing, and trade. However, cross-cutting socio-economic constraints ranging from culture to access to inputs, infrastructure, national policies, marketing, and financial aspects still marginalize these two societal groupings. The comparative review thus concluded by proposing recommendations that can be upscaled to the SSA countries.

Keywords: Food security; Gender inclusion; Livelihoods; Low-income country; Socio-economic development; UN SDGs

INTRODUCTION

Equal and equitable participation of women, youths, and other vulnerable groups in capture fisheries and aquaculture value chains is necessary for the wise use and conservation of aquatic resources to foster food security and sustainable socio-economic development in sub-Saharan Africa (SSA). Empowering youths and fostering gender equality are core to the attainment of the targeted United Nations 2030 Sustainable Development Goals (UN SDGs). Many factors shape the level of involvement of social groupings in the active management and utilization of aquatic resources for economic development.

For many centuries, fish has been one of the world's major food sources and has supported livelihoods (Kaplinsky, 2000¹; Tezzo *et al.*, 2021²). FAO (2016)³ advised that to achieve food security, reduce poverty, and spur global economic growth, ensuring the growth of small-holder aquaculture and managing capture fisheries is essential. Worldwide, fish products essentially provide more than 20% of the average per capita consumption of animal protein for roughly 3.3 billion people globally (FAO, 2020)⁴. In emerging

economies in sub-Saharan Africa, millions of local communities rely on both wild capture fisheries and fish farming for their livelihoods (World Fish, 2014⁵; Musuka & Mainza, 2015)⁶.

Aquaculture is still growing in Africa, as millions of underprivileged households still depend on crop farming and capture fisheries for their livelihood. Small-scale fish farming is a relatively recent endeavour which still needs further intervention to act as a significant source of empowerment for women and youths (FAO, 2022)⁷. Overall, aquaculture has grown in significance in terms of food production, economic growth, and food security, contributing to the meeting of the rising demand for fish in sub-Saharan Africa. Several fish species have been genetically developed for aquaculture, such as the “*Genetically Improved Farmed Tilapia*” (GIFT) in Kenya, via the efforts of WorldFish and its partners, but many challenges still affect women’s and youth’s participation in both sectors (FAO, 2022)⁷. Due to relatively abundant rainfall, tropical temperatures, and a significant reliance on subsistence agriculture, Ethiopia, Kenya, Malawi, and Zambia appear to be desirable sub-Saharan nations for aquaculture, despite the numerous impediments to the acceptance and dissemination of fishponds (Nkhoswe *et al.*, 2023)⁸.

However, society and culture induce gender roles that are thought to be desirable and acceptable by the people in a specific socioeconomic environment, which can ultimately impact the behaviour of its members (Torell *et al.*, 2015)⁹. This is the case with female and youth involvement in the capture fisheries and aquaculture value chains in sub-Saharan Africa (Weeraturunge *et al.*, 2018)¹⁰. Women dominate over 50% of the inland fishing labour and about 42% of the workforce of commercial aquaculture companies in sub-Saharan Africa, though they are not proprietors of the businesses (GIZ, 2013¹¹; AfDB, 2012¹²). Women and youths are traditionally considered to be vulnerable groupings in Africa due to their common lack of properties and fixed assets, lesser income and inexperience than old men, and the patrilineal family systems common in the SSA, among other factors.

Women and youths participate in all aspects of the fish value chains, but post-harvest roles like processing and trading account for most of their duties reports, AUC-NEPAD (2014)¹³. Post-harvest operations account for over half of the 1.4% of Africa’s GDP that fisheries provide, demonstrating the significance of women’s economic contribution to the industry (NPCA & AU-IBAR, 2016)¹⁴. Dissecting the statistics, about 96% of women work in post-harvest activities, 3.1% are fishermen, and 0.7% are in the aquaculture sector (AU-IBAR, 2021)¹⁵.

Despite the crucial role that women and youths play in fisheries and fishing communities, their contributions are sometimes overlooked or viewed as an “*assisting hand*” to the businesses and household duties, which excludes them from the conversation about fisheries. Women’s engagement in indirect fishing activities, such as parenting, household management, community surveillance and patrolling, and conservation and monitoring initiatives, has not yet been adequately accounted for in the fisheries value chain (Musumali *et al.*, 2009¹⁶; Torre *et al.*, 2019¹⁷). Figures 1a and 1b below show sex-disaggregated data on employment created by capture fisheries and aquaculture in the various continents, as sourced from FAO (2022)⁷.

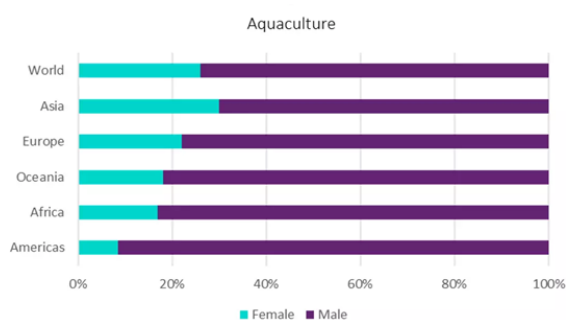


Figure 1a: Continental-wide employment in the aquaculture sector, indicating women’s participation,

according to FAO (2022)⁷.

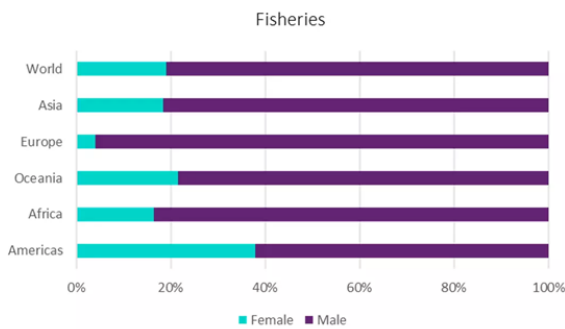


Figure 1b: Continental-wide employment in the capture fisheries sector, indicating women’s contribution, according to FAO (2022)⁷.

Though there have been recent reports of changing trends as regards the reduced gender inequalities in the fish value chains in sub-Saharan African countries, such as in Zambia’s Barotse flood plain, disparities still exist that need further interventions (FAO, 2018)¹⁸. A lack of appreciation for women’s distinctive roles and contributions may prevent their demands and interests from being taken into account in policies and programs, which could have an impact on the success of sustainable development (MFF, 2016)¹⁹. The ongoing set of disparities in the treatment of men and women impedes women from fully engaging in economic opportunities and decision-making, which ultimately limits the sector’s potential (FAO, 2014)²⁰.

Therefore, suitable measures and policies must be implemented to guarantee that the blue-green economy is a sustainable sector that catalyzes fair economic growth and improves the lifestyles of people, especially youths and women in the SSA countries. This extensive review focuses on the challenges faced by women and youths involved in the capture fisheries and smallholder aquaculture value chains in the selected four sub-Saharan African countries — Ethiopia, Kenya, Malawi, and Zambia.

METHODOLOGY

To synthesize the available data on youths and women’s roles and challenges in capture fisheries and smallholder aquaculture, the search was based on the methodological principles of the systematic literature review (Haddaway *et al.* 2015)²¹. The data was obtained from peer-reviewed journal articles, book chapters, technical reports, dissertations, and conference papers by conducting topical online searches. Keywords (such as aquaculture, gender, youth, and value chains) and asterisks were used to enhance the search results’ breadth in the Web of Science (WoS), Google Scholar, ScienceDirect, AGORA, academic institutional e-repositories, and Scopus databases.

Searches were performed from August 2022 until October 2023, according to Smith and Basurto’s (2019)²² review, by ensuring that the keywords included both modern phrases (such as “small-enterprise” and “artisanal fishing,” Aburto *et al.* (2021)²³, as well as older ones such as “small-scale” (Thomson, 1980)²⁴. As for the case of Kenya, the data reviewed excluded case studies on marine capture fisheries and marine aquaculture. Only freshwater capture fisheries and inland aquaculture were in focus for the reviews in all the selected countries, with the focus being on the challenges faced by youths and women that impede their active participation in the capture fisheries and small-enterprise aquaculture value chains.

For discussion purposes, similarities in the challenges faced in the countries were drawn for comparisons to the findings of other researchers in other sub-Saharan African countries, such as Ghana. This paved the way for conclusions and recommended measures that are required to be undertaken for the improvement of the situation in these SSA countries, which will foster the attainment of the UN-SDGs by 2030. Figure 2 below shows the framework of the methodology used to review and analyze the data:

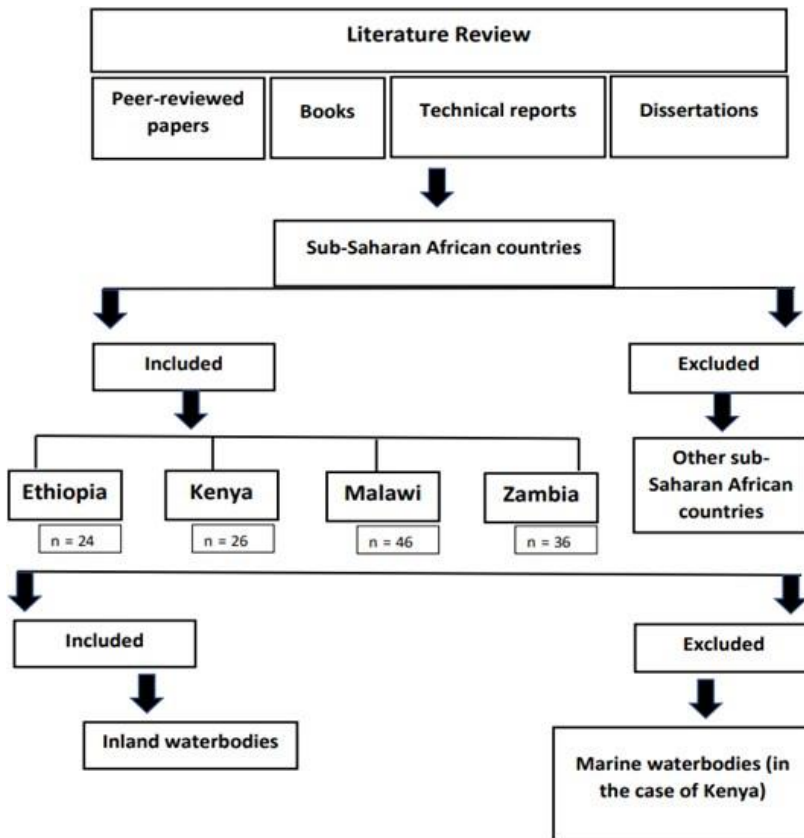


Figure 2. Literature review approach for the selected sub-Saharan African countries in the present study, indicating inclusion and exclusion criteria for past published studies and the number of papers (n) reviewed from each of the respective countries. (Adapted from Kibret et al., 2017)²⁵.

DATA COLLECTION AND CRITICAL ANALYSIS

3 a. Ethiopian capture fisheries and aquaculture value chains

Ethiopia is an agrarian nation where agriculture is the country's principal economic sector, providing over 70% of the country's industrial sector's raw materials while also accounting for roughly 43% of the GDP, 85% of employment, and 90% of all export revenues (Chanyalew *et al.*, 2010)²⁶. Agriculture is broadly defined to cover crops, livestock, capture fisheries, aquaculture, forestry, and the management of natural resources in this aspect. Ethiopia has been a landlocked country since 1993, so its fishery comes exclusively from inland water bodies, including lakes, rivers, streams, reservoirs, and substantial wetlands that are of great socio-economic, ecological, and scientific importance. The country is endowed with 7,400 km² of total lake area and about 7,000 km of total river length (Getahun *et al.*, 2008)²⁷.

Ethiopia's capture fishery is mainly artisanal, using wood and reed boats, except for some motorized commercial fishing in Lake Tana and lakes along the Rift Valley (Lakew *et al.*, 2018)²⁸. Since the country is a landlocked nation, it relies on aquaculture reserves and inland catch fisheries to meet its expanding fish demand (Janko, 2014)²⁹. In 2018, aquaculture contributed just 0.2% of the nation's total fish production (FAOSTAT, 2020)³⁰. Hence, the existing role of the sector is insignificant in the country's overall economy because it is far below its potential (Kebede *et al.*, 2017)³¹. Although Ethiopia's environmental and socio-economic conditions support the development of aquaculture (FAO, 2014)³², a review of the literature shows otherwise. Asmare *et al.* (2019)³³ deemed the aquaculture production negligible as no significant aquaculture development is taking place in Ethiopia.

The overall potential yield of fish in Ethiopia's water bodies is estimated at 94,500 tons per year on average (Tesfaye & Wolff, 2014)³⁴. However, current production is still far below the estimated potential yield,

which suggests the possibility of further expansion of the fishery. Water bodies located in the Rift Valley show signs of overexploitation, whereas those located in remote areas with poor infrastructure, which make up the majority, remain under-utilized (Janko, 2014)²⁹. For many Ethiopians, fish is their primary source of protein, especially those who live close to large bodies of water like Lake Tana, the lakes in the Rift Valley, and rivers in the Gambella region.

Ethiopia also faces some challenges in the capture fisheries and aquaculture sectors that hinder their expansion. One of the challenges is the low demand for fish products among the population. Janko (2014)²⁹ reported that fish is not a common part of the diet in most parts of the country, except for some areas. Most people prefer cattle meat, and some also avoid fish for religious reasons. Fish consumption in Ethiopia is influenced by various factors, such as accessibility, availability, processing, distribution, and regional culture. It is also seasonal and depends on the religious fasting schedules of the Ethiopian Orthodox Christians, who make up about 43% of the population. According to Seleshe *et al.* (2014)³⁵ fish is a common dish on fasting days when meat is prohibited, along with vegetarian meals made from pulses and vegetables. However, the same authors also note that some conservative Orthodox Christians are abstaining from eating fish on fasting days, believing that fish has the same blood as any of the prohibited animals.

Moreover, the limited supply and high price of fish products are making them less affordable and accessible for many consumers. Kebede *et al.* (2017)³¹ reported that the major constraints to the capture fisheries sector are environmental degradation causing low yields, coupled with low institutional capacity, limited infrastructure facilities and equipment, poor management of the capture fisheries, and small-scale fish ponds, thus exacerbating fish diseases. Thus, there is a need for more investment and innovation to overcome these challenges and enhance the potential of the blue-green economy in Ethiopia.

Women play a vital role in the capture fisheries sector in Ethiopia, especially in post-harvest processing and marketing. For example, in Fogera woreda, women catch and dry catfish from seasonal ponds connected to Lake Tana floodplains as a source of income (Gordon *et al.*, 2007)³⁶. Asmare *et al.* (2017)³⁷ conducted research from February 2014 to December 2015 in five districts surrounding Lake Tana and also found that women are mainly responsible for post-harvest activities and marketing, as shown in Table 1 below.

Table 1: Men and women’s roles in pre-fishing and fishing activities (Asmare *et al.*, 2017)³⁷

Sex	Activities	Full involved		Mostly		Sometimes		Rarely		Not involved		χ ² -test
		n	%	n	%	n	%	n	%	n	%	
Men	Prepare fishing net	61	93.8	3	4.6	1	1.6					107.2**
	Wutwota ¹	59	90.8	6	9.2		-	-	-	-	-	41.6**
	Maintain net	64	98.5	1	1.5	-	-	-	-	-	-	59.1**
	fishing	63	94	4	6	-	-	-	-	-	-	53.7**
Women	Prepare fishing net	6	9.2	4	6.2	7	10.8	11	16.9	37	56.7	57.4**
	Wutwota	9	13.8	3	4.6	14	21.5	11	16.9	28	43.1	26.6**
	Maintain net	4	6.2	-	-	12	18.5	11	16.9	38	58.5	41.2**
	fishing	-	-	-	-	-	-	3	4.6	62	95.4	55.4**

** Highly significant at p < 0.01

Similarly, in the Gambella region, women handle post-harvest processing and marketing, while men focus on fishing, filleting, boat and gear maintenance, and purchase (Cheffo *et al.*, 2015)³⁸. Women in Gambella also perform many unpaid tasks before and after fishing, such as mending nets, collecting bait, preparing food for fishers, and keeping accounts. However, unlike in other regions, women in Gambella have a say in selling the catch because they are regarded as better negotiators than men, and generally avoid conflict.

Although fishing is an important economic activity for many households near water bodies in Ethiopia, especially for the youths, who are the main labour force in this sector, not all youths have equal access to fishing resources and technologies. For example, in female-headed households in Gambella, youths catch fish from seasonal ponds or rivers using hooks, which results in a lower volume and diversity of fish caught than in male-headed households (Cheffo *et al.*, 2015)³⁸. In the latter, youths regularly check nets and hooks for fish, sort fish by type and size for the market, and transport fish to the market. In both types of households, youths also process the fish, such as filleting, gutting, and drying (Cheffo *et al.*, 2015)³⁸.

Moreover, youths in the fishing community face many challenges and constraints that limit their potential, such as a lack of policies, infrastructure, technology, market information, and post-harvest handling (Tesfay & Teferi, 2017)³⁹. They also encounter problems of overfishing, pollution, and deforestation, which threaten fish resources (Kamaylo *et al.*, 2021)⁴⁰. Several initiatives were launched to support the youths in the fisheries sector (such as the Livestock and Fisheries Sector Development Project P159382 by the World Bank), which introduced a new fish trade in the Abaychoman District of Oromia Region. In the Gamo Zone, a similar project enabled the youths to create their fish businesses and enhance their living standards (Kamaylo *et al.*, 2021)⁴⁰. These activities have helped the previously unemployed youths generate income from all stages of the fish value chain and improve their livelihoods.

According to Askale & Tegegne (2019)⁴¹, in the South-Western part of Ethiopia, there is a division of labour between men and women in cooperative establishments. Women cooperative members are engaged in washing nets, processing, transporting, and selling the captured fish, while men are mainly involved in capturing. This shows that women have a vital role in post-harvest activities, but they are excluded from the primary production stage. Teshome *et al.* (2016)⁴² also found that in the Oromia Region, both women and youths were actively involved, and their contribution was valuable to the existing development of the sector, but their efforts and contributions were not well recognized or clearly quantified. Their study results revealed that 94.3% of the male respondents engaged in fish farming, trainings and workshops alone. This indicates a lack of access and opportunity for women to acquire the necessary skills and knowledge for aquaculture development.

Furthermore, the study found that women could not take on the responsibility of feeding the fish or managing the ponds due to the tradition that expects women to hold responsibilities for cooking and providing food for the entire household (Teshome *et al.*, 2016)⁴². In contrast, a study conducted in Gilgel Gibe Dam showed that 68% of the respondents involved in small-scale fishing were below the age of 40, with the gender being 95% male and 5% female, respectively (Cheffo *et al.*, 2015)³⁸. This suggests that the fishery sector attracts more youths than women, but the gender gap is still significant. Ethiopian gender considerations are skewed in favour of the males, and the access that women have to useful resources is frequently under their husbands' control. Women's lack of independence and exclusion from leadership are frequently asserted to be ingrained in the socio-cultural norms of society (Kinati & Mulema, 2019)⁴³.

Gender disparity is a direct result of planned economic and social development that is based on false assumptions about gender roles as well as culture and tradition (Flintan, 2006)⁴⁴. Numerous research studies in Ethiopia show that there are major gender disparities in agriculture at the national level, which favour men (Yisehak, 2008⁴⁵; Leulseged *et al.*, 2015⁴⁶). Moreover, Gella & Tadele (2015)⁴⁷ noted that although rural women make some contributions to Agricultural output (fisheries and aquaculture), they are typically seen as supporting cast members. The ratio of males to females in the labour force varies depending on the type of business, farming system, technology, and household affluence (Tangka *et al.*, 2000⁴⁸; Aregu *et al.*, 2010⁴⁹).

Different assumptions were made as to why women contribute less when it comes to aquaculture. The findings of Askale & Tegegn (2019)⁴¹, agreed with those of Kinati & Mulema, (2019)⁴³ who revealed that apart from the fear of drowning and a lack of experience and skill to swim and barge, local customs in rural

areas traditionally expect women to hold responsibilities for cooking and providing food for the entire household instead of being involved in outdoor activities. Children and teens are also actively involved in all fishing activities in fishing villages to help the family with food production and cash generation, as well as to help pay some basic school expenses (Tsfaye & Wolff, 2014)³⁴.

While youth unemployment has continued to be a challenging global issue, a sizable agrarian population of rural adolescents in Ethiopia has confronted this through the fisheries sector (Cartmel & Furlong, 2000)⁵⁰ thereby boosting food security and alternatively sourcing income that has enhanced rural people’s livelihoods sustainably. The Ethiopian Ministry of Agriculture (MoA) views the fishing sub-sector as one of the potential intervention areas (Getahun & Fetene, 2020)⁵¹. Thus, capture fisheries and aquaculture in Ethiopia are recognized as alternative means of offering food security in particular and poverty reduction and are now considered an integral part of rural and agricultural development strategies (Kebede *et al.*, 2017)³¹ should more youths and women actively engage in them.

3 b. Kenyan capture fisheries and aquaculture value chains

Many researchers have asserted that capture fisheries and small-holder aquaculture value chains are significant sources of income and livelihoods in third-world countries, including Kenya (Beveridge *et al.*, 2013⁵²; Béné *et al.*, 2016⁵³; Wanja *et al.*, 2020⁵⁴). However, in Kenya, women have a larger postharvest and marketing role in the fish value chain. A closer look into gender roles in the Lake Victoria fishery from a study by Lwenya *et al.* (2009)⁵⁵ revealed that the responsibility of fishing was entrusted to men, while women predominated in post-harvest activities like fish processing and commerce. Like in Ethiopia, a closer look into gender roles in the fish value chains in Kenya reveals that whereas males are primarily engaged in labour-intensive tasks such as pond excavation and preparation, pond management, fish harvesting, and fish feeding, women are mostly engaged in fish processing, trade, and marketing (Nabayunga *et al.*, 2021)⁵⁶.

In many African nations, women and youths typically play a significant role in the production, processing, and sale of agricultural products (Ndanga *et al.*, 2013)⁵⁷. Aquaculture and capture fisheries, though, are not popular sectors among many youths in Kenya. According to a study by Imaizumi (2020)⁵⁸ on jobs, skills, and the prospect of artificial intelligence in Kenya, accounting positioned first among the top 20 qualifications in demand, while between 2015 and 2019, the demand for information technology, network developers, and maintenance skills in the computer science and engineering fields increased. It was discovered that although both universities offer courses in specific departments that focus on business and soft skills—15% of courses at the University of Nairobi and 25% of courses at Moi University—they still must broaden their course offerings to keep up with employer demand. Nevertheless, the study disregarded the soft skill components, which are vital to the hiring process. Table 2 shows an overview of the contribution of the Kenyan inland fisheries to the creation of jobs among various age groups in Kenya, with the highest percentage of youths aged 15-34 years involved in fish-mongering.

Table 2: Involvement of individuals in the fish sector by age (%). (Munene & Wanjiku, 2016)⁵⁹

	15-34 (Youths)	35-59	60 and above	Total
Fish monger	88.83	92.11	95.56	89.46
Fisher	3.64	6.45	0	0.67
Boat repairer	2.59	0.36	4.44	2.31
Fish cooling	2.34	0	0	1.95
Fish processor	0.68	0.72	0	0.67
Fish scaling	1.91	0.36	0	1.65

A study by Lwenya & Yongo, (2012)⁶⁰ reveals that, compared to Tanzania’s 10% and Uganda’s 16%,

roughly 48% of the women in the fish business at Kenya’s landing beaches were fishermen’s wives. Even so, their involvement in the sector is still frequently viewed as a customary household duty and typically given no economic importance (Tayyib *et al.*, 2013)⁶¹. Fortunately, though, this has not deterred women from getting involved in the fish farming industry. Women have gained the ability to invest in the aquaculture industry through table banking, such as “*chamas*” (a round-robin system of saving and lending money) (Mangoa, 2013)⁶², which functions in a variety of operations related to hatcheries, production, processing, and trade.

Aquaculture’s development in Kenya by women and youths is hindered by common challenges similar to those in other sub-Saharan African countries. Aquaculture in Kenya is characterized by five principal players in the value chain, from fish seed and feed production to the final stage of fish harvesting, processing and fish marketing. These actors include (i) suppliers of raw materials (ingredients); (ii) feed formulators and manufacturers; (iii) distributors/ wholesalers; (iv) retailers; and (v) customers who are fish farmers (Munguti *et al.*, 2021)⁶³ all of whom have to work closely together from the provision of raw materials to the final consumption of the finished product without any of the players traversing the whole chain of operation.

A review of publications containing in-depth information on Kenya’s inland capture fisheries and aquaculture development reveals that the sector is remarkably gender-blind. Even with the world’s fast-growing interest in the subject of gender and fisheries, limited articles extensively discuss the various roles and contributions of men and women in the capture fisheries and aquaculture industries in Kenya due to the general assumption that gender homogeneity exists in the sectors (Kruijssen *et al.*, 2018)⁶⁴. Affirmative action and gender mainstreaming in capture fisheries and aquaculture development in Kenya are key areas that need to be taken up to strengthen women’s active participation in the developing sector (Orina *et al.*, 2019)⁶⁵.

Cultural, social, economic, and political factors have been reported to encourage women’s participation in the fish marketing industry, with the necessity for cash serving as the major driving cause for youths pursuing the agriculture sector, especially the capture fisheries and aquaculture sector (Fox *et al.*, 2021)⁶⁶.

In Kenya’s riparian county of Homabay, despite the ideal conditions for the placement of cages in Lake Victoria, the county still staggers with high poverty levels that are associated with widespread rates of HIV with women being the most affected (Abwao & Awuor (2019)⁶⁷. Women in these areas additionally have very limited choices to control behaviours like multiple sexual partners, condom use, sexual abstinence, or aquaculture entrepreneurship due to their economic vulnerability and heavy reliance on men, their husbands or mere sexual partners (Otieno, 2011)⁶⁸. ‘Violence against Women (VAW)’ still holds the highest rank in the violation of women’s rights within the fisheries sector. Abwao & Awuor (2019)⁶⁷ uncovered various forms of physical, mental, and sexual harassment within the aquaculture value chain in Homabay County (Figure 3).

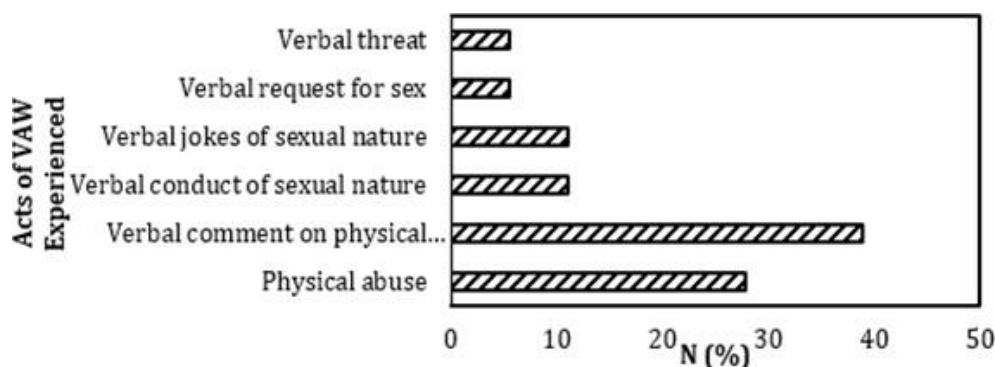


Figure 3: Forms of VAW within the Aquaculture value chain in Homa Bay County (Abwao & Awuor, 2019)⁶⁷

Studies by Githukia *et al* (2020)⁶⁹ indicated that fish farming in Kenya is largely controlled by male farmers who are over 50 years of age, in which case most of the households are male-headed and managed. This finding concurs with similar studies by Kiumbuku *et al* (2013)⁷⁰ and Obiero *et al* (2019)⁷¹ who reported that most fish farming households are headed by males. Since most fish farmers are male and above 50 years of age, this implies that due to the strict nature of male-headed households, there is limited access to production factors by women and youths, and thus fish farming has not been well embraced in the country (Chebet, 2019)⁷². This may also be due to challenges with unravelling gender awareness and opportunities in the aquaculture value chain in Kenya (Githukia *et al.*, 2021)⁷³.

In the capture fisheries value chain however, Kizito (2016)⁷⁴ reported, in his academic research findings, that a smaller number of men and women over 50 years were involved in economic activities that relate to the fish value chain with more older men and youths of ages 20-44 years being directly involved. This could be attributed to the lucrative labor that is involved in the activities that favor older men and youth participation in entrepreneurial activities compared to their women counterparts. This agreed with the findings of Kiumbuku *et al* (2013)⁷⁰ who examined and evidenced many kinds of gender inequalities in the aquaculture and capture fisheries sectors in Trans Nzoia County.

Table 3: Age of men and women in the fisheries value chain in Nairobi County, (Kizito, 2016)⁷⁴

		Men		Women	
		Frequency	Percentage	Frequency	Percentage
Age(Years)	20-25	26.0	12.7	10.0	5.7
	25-29	34.0	16.7	20.0	11.5
	30-34	42.0	20.6	52.0	29.9
	35-39	43.0	21.1	27.0	15.5
	40-44	25.0	12.3	26.0	14.9
	45-49	19.0	9.3	18.0	10.3
	50-54	9.0	4.0	14.0	8.0
	55-59	6.0	2.9	7.0	4.0
Total		204	100	174	100

In terms of land ownership, the Kenyan market-led aquaculture program’s gender impact study found that more than 80% of all aquaculture ponds are located on family-owned or ancestral land, with just over 13% of ponds constructed on parcels of purchased land (Farm Africa, 2016)⁷⁵. This presents a challenge to women and youths in the aquaculture sector. More than 90% of the land is family land thus, is largely presided over by household heads, usually men, while women and youths have little to no say in the land use employed on the owned land.

The present review established that women and youths are additionally faced with land inheritance challenges. Kenya’s customary inheritance of land prioritizes men over women. Based on an earlier study, Walingo (2009)⁷⁶ also discovered that women control less than 2% of agricultural assets in Africa. Even if women were financially empowered through group savings such as “*Merry Go Round*” or support from NGOs, they would first consult their husbands before investing in aquaculture. This bottlenecks the growth of the aquaculture sector, as refusal by the male head means that the female gender cannot thus invest in fish farming or make further advancements in the business along the fish value chains.

Women and youths face property ownership and land inheritance challenges in Kenya. This poses a threat to the country’s fish production continuity because, increasingly, ageing farmers typically experience difficulties in adopting new aquaculture technologies that are valuable for increased profitability and

efficient productivity. The aquaculture business in Kenya is further characterized by a significant proportion of women who have lower levels of education than their male counterparts (Kiumbuku *et al.*, 2013)⁷⁰. Having more men in the aquaculture business completing tertiary education indicates their greater chances in the sector.

Women, on the other end of the spectrum, are less likely to have completed elementary and secondary school, which is critical for learning fundamental fish farming skills. According to Ouko *et al.* (2022)⁷⁷, although uneducated farmers can be able to understand and analyze basic information for their use at the farm level, higher levels of education ease the process of learning, technology adoption, and application of both scientific and mathematically related concepts in the aquaculture sector. In another study by Obiero *et al.* (2019)⁷¹, knowledge and use of all male tilapia fingerlings produced through sex-reversal technology, which is associated with higher aquaculture productivity and profitability, were more common among male farmers and male-headed households than among female fish farmers and female-headed households. Adoption of technologies in fisheries as well as aquaculture is a factor of education and capital; poor investment in women's and youths' education and mentorship directly reduces their capacity to venture into the food production sector in Kenya (Obiero *et al.*, 2019)⁷¹.

In addition, in many rural areas of Kenya, access to financing and credit facilities is typically challenging for young people working in the aquaculture industry, households headed by females, and also for most female fish farmers (Githukia *et al.*, 2021)⁷³. This affects fish production, as fish take an extended time to mature because the farmers cannot afford quality feed. Women also have challenges in attending training due to mobility challenges closely linked with domestic/ household responsibilities, as noted by Lawless *et al.* (2019)⁷⁸ and Githukia *et al.* (2020)⁶⁹. Although financial constraints affect both gender identities, women face a greater challenge than men (Githukia *et al.*, 2020)⁶⁹ due to their household social status.

For inclusive empowerment as well as advancement in economic status, gender awareness of opportunities in the aquaculture value chain is important, as these form the foundation upon which successful aquaculture depends as well as a nation's growth. FAO (2011)⁷⁹ stated that improved youth and female engagement in aquaculture might enhance equitable access to and control over resources, which is critical in fulfilling the United Nations Sustainable Development Goals (UN-SDGs) II, III, V, and XIII on zeroing hunger, promoting gender equality for holistic development, and climate action for food security resilience, and reduction of environmental degradation. These comments are consistent with those of Weeratunge *et al.* (2010)⁸⁰, who discovered a direct relationship between gender equity and socioeconomic progress. Gender equality and inclusion in all areas of the blue economy must be prioritized. In Lake Victoria Basin, UNDP (2019)⁸¹ commented on the subject, stating that increased female participation in the sectors would assure joint responsibility for the protection and sustainable use of water resources while boosting chances for decent jobs and poverty reduction at the family level.

3 c. Malawian capture fisheries and aquaculture value chains

Malawi, like Zambia and Ethiopia, is a landlocked nation with primarily inland freshwater fish production, but with the distinction of being located in the African Great Lakes region. Water covers 20% (24,405 km²) of Malawi's total land area, with the greatest composition being Lake Malawi, Malombe, Chilwa, and Chiuta (Jamu *et al.*, 2011)⁸². These lakes, together with the upper and lower Shire Rivers, are the largest fisheries in Malawi, employing over 500,000 people and contributing around 4% to GDP (DoF, 2016)⁸³. Malawi's fish supply has historically been primarily reliant on wild fisheries and imports from neighbouring countries such as Zambia, Tanzania, and Mozambique (Tran *et al.*, 2022⁸⁴; Makwinja *et al.*, 2021⁸⁵). Recent household surveys and government sources indicate that fish is the most common animal protein source in Malawian families, accounting for about 70% of the total animal protein consumed (DEPD, 2019⁸⁶). However, a study by Manyungwa *et al.* (2019)⁸⁷, on social interactions and women's involvement in Malawi's fish value chains found traces of gender-based discrimination, which hinders female participation in the blue-green economy.

Meanwhile, wild fish stocks in Malawi are declining due to overfishing, exacerbated by population growth and a lack of alternative income-generating opportunities for the local fishermen in the fishing communities (Mweninguwe, 2013⁸⁸; Mulumpwa, 2018⁸⁹; Kanyerere *et al.*, 2018⁹⁰). Worse still, climatic changes, such as drastic fluctuations in rainfall and surface temperatures, are expected to have a detrimental influence on Malawi's agriculture and inland fishing production (O'Meara *et al.*, 2021⁹¹). Furthermore, considering Malawi's geographical position, its inland fisheries may be severely affected by climate change (DoF, 2016⁸³; Thilsted *et al.*, 2016⁹²). Eutrophication, agricultural runoff and development projects, infrastructural problems, and post-harvest losses are further risks to the capture fisheries performance (DEPD, 2019⁸⁶; Torell *et al.*, 2020⁹³). As a result, per capita fish consumption in Malawi was halved from about 14 kg/year in the 1970s to less than 7 kg/year in 2005 (Russell, 2008⁹⁴; (Nakwenya *et al.*, 2017)⁹⁵. It was estimated that about 90% of fish in Malawi is supplied by small-holder fishermen and fish growers (DoF, 2016⁸³; Simance *et al.*, 2021)⁹⁶.

Smallholder farmers make up the majority of Malawi's aquaculture industry. They are mostly unfocused on the market and face a variety of obstacles that lower their productivity and lower production quantities, which disadvantages their financial returns (Munthali *et al.*, 2022)¹²⁷. In this review, the main focus in Malawi was on small-enterprise value chains and networks around the production and trading of *Barbus paludinosus* (matemba) for Kachuluon Lake Chilwa, *Engraulicypris sardella* (usipa) for Msaka on Lake Malawi and *Oreochromis lidole*; the Lake Malawi tilapia (Chambo). Climate change, low investor interest, a lack of fingerlings, poor feed quality, and restricted access to financial services all demand a comprehensive overhaul of the industry that will satisfy the rising demand for high-quality animal proteins, generate jobs, and lower rates of poverty among the most marginalized members of society — young people and women in this lens. The hazards connected to fish farming among smallholder farmers reduce the interest of eco-friendly investors.

Achieving gender equality and female empowerment in the fishing business is still difficult, despite decades of research demonstrating the economic contributions of women, collective action to advance female concerns and privileges, and the latest attempts by institutions to implement gender inclusion in the sector. (Gopal *et al.*, 2017)¹³¹. It was interesting to note that Malawian women who work in the fishing value chain have greater access to credit and savings, as well as more equal negotiating power within a home Gumulira *et al.* (2019)¹⁰⁹.

Women and youths in Malawi, like in other SSA countries, have usually been excluded from participation as a resource user group in fisheries governance and resource management. The current Malawi's National Fisheries and Aquaculture Policy (2016)¹⁰² has been a vital aspect of national development goals aimed at improving the government's poverty-alleviation plan. It prioritized increasing revenue and employment, enhancing fish supply and distribution by focusing on marketing and quality, and including the private sector in the growth of the fisheries industry. The policy establishes operational principles for aquaculture growth, including the creation of standards for controlling and protecting the genetic variety of threatened fish. Malawi's government established several research and academic institutes to aid in the growth of the aquaculture industry in the country by enhancing female and youth participation (DoF, 2016)⁸³.

Women and youths in Malawi have diverse impacts on the environment and contribute differently to the exploitation of aquatic resources (FISH, 2015)⁹⁷. Women's fishing involvement is often characterized by varied and dynamic situational engagement (FAO, 2016)³. Their participation is sometimes "self-initiated" and a seasonal activity, especially during times of famine, to provide for the family (Villamor *et al.*, 2014)⁹⁸. According to reports, women make up the majority of traders in the Mangochi neighbourhood. They participate actively in post-harvest processes such as solar drying, smoking, and parboiling fish (Bartley *et al.*, 2020)⁹⁹. However, societal customs, norms, and unfavourable state regulatory structures limit women's access to fisheries resources, assets, and decision-making in developing countries, inclusive of Malawi (Weeratunge *et al.*, 2011¹⁰⁰; Kodish *et al.*, 2015¹⁰¹) thus limiting them to the lower ranks of supply chains.

Funded by the African Development Bank (AfDB), the Sustainable Fisheries, Aquaculture Development, and Watershed Development Project (2020–2025)¹⁰³ addresses the goals outlined in Malawi's Growth and Development Strategies III (MGDS III: 2017–2022), with a focus on agriculture and food security. The project also adheres to the National Fisheries and Aquaculture Policy (2016), with four components: (i) sustainable capture fishing and watershed management; (ii) aquaculture development; (iii) strengthening the fish value chain; and (iv) project management, coordination, monitoring, and evaluation. Bearing a 60-month implementation time frame, the project aimed at encouraging diversification from capture fisheries to aquaculture ventures to increase production and incomes, thereby increasing livelihoods and employment opportunities; lowering local fish prices; increasing commercial fish exports; and increasing fish production to ensure food and nutritional security. The achievement of such projects requires the full participation of women and youths.

At present, the aquaculture branch employs 15,465 people, with 62% being men and 38% being women (National Fisheries and Aquaculture Forum (NFAF), 2022)¹⁰⁴. A study by CASA (2020)¹⁰⁵ in Malawi revealed that the main actors in fish production and post-harvest handling include the two major commercial producers, MALDECO and Chambo Fisheries, plus 15,465 registered SHFs spread across the country, of which only about five show some signs of the aptitude to step up their production. Only one woman was a legally recognized proprietor among other women with potential for development, while the others were privately owned and managed by males. Malawi's rural population is subject to rising livelihood challenges as a result of the combined effects of soil erosion, deforestation, HIV/AIDS, and climate change, among other socio-economic issues. The need for more fish as a protein source is evident. Given the scarcity of alternative livelihoods in metropolitan areas, rural inhabitants must enhance the efficiency with which they use land and water resources to survive.

Similarly, because of the high initial investment requirements, there is evidence of low youth and female engagement in the future expansion of aquaculture output. Thus, men presently dominate the aquaculture production function, with women mostly engaging through small-scale producer-farmer organizations. Nagoli *et al.* (2018)¹⁰⁶ commented that women in Southern Lake Malawi perform an array of jobs at the community and family levels, mainly in home production and non-paying productive labour. As a result, women take care of home tasks, children, the elderly, and the sick. Women are unable to attend to their businesses or engage in community development activities or initiatives as a result of this.

Nagoli *et al.* (2018)¹⁰⁶ additionally found that some women are not permitted by their husbands to sell their processed fish in far-away marketplaces. Household tasks that women often perform on a daily basis cause them to stay at home and forbid them from venturing out to far-away marketplaces, where they typically stay for lengthy hours or days. Women are prevented from selling their fish goods in profitable marketplaces where they could make more money by just selling in local markets. Women are therefore prevented from actualizing their creative potential due to the social, cultural, traditional, and religious standards that exist in the majority of communities (Nagoli *et al.*, 2018).¹⁰⁶ This agrees with the studies of Chimatiro *et al.* (2021)¹⁰⁷ who studied the contribution of fisheries to the African Great Lakes regional food system.

Women have less time and flexibility in their daily schedules due to household commitments such as child care (Nagoli *et al.*, 2010)¹⁰⁸. Although both men and women work in the fish processing industry, it was found by Gumulira *et al.* (2019)¹⁰⁹ that women are more involved in sun drying smaller fish such as Usipa (*Engraulicypris sardella*), Matemba (*Barbus spp*), and Utaka (*Copadichromis spp*), whereas men are more involved in smoking Utaka, Matemba, and larger species such as tilapia and catfish. Smoking fish adds more value than simply sun-drying it. Earlier, Mapila *et al.* (2010)¹¹⁰ observed that most smallholder farmer organizations had limited or no links with policymakers, which had a detrimental impact on the organizations' performance. Inadequate commitment among many female participants was also noted because of a disparity between actualized and projected benefits from the organisations, complacency on the part of certain members, and poor leadership.

Further, Njera *et al.*'s (2016)¹¹¹ study found that members' lack of confidence was caused by variability in several socioeconomic variables. These problems have various consequences or repercussions on farmer organizations' abilities and the performance of youths and women. While women's and youths' participation in production has historically been limited predominantly to feeding fish in household ponds, studies have shown that both women and youths play a substantially larger role than men at downstream nodal points of the value chain. This is especially evident in capture fisheries, where women and young people are significantly more active in downstream operations such as sale brokerage at landing locations, fish processing such as smoking, local trading, and exporting via informal cross-border commerce (Afrika & Ajumbo, 2012¹¹²; UNCTAD, 2019)¹¹³.

Njera *et al.* (2016)¹¹¹ also studied the implications of the challenges affecting the capacity of fish farmer organizations in Dowa and Mchinji Districts in Malawi. It was found that there was a lack of cooperation among female members of the fish farmer organizations. The fish farmers' poor cooperation affected internal cohesion, which constrained organizational activities such as the formulation of institutional arrangements. This, thus, defeats the whole essence of the strategy for enhancing fish farming. This assertion agrees with Cinner *et al.* (2011)¹¹⁴ & Murekezi *et al.* (2020)¹¹⁵ who argue that cooperation among members is a significant element contributing to the success of farmer organizations in enhancing fish farming.

Based on research results by Manyungwa-Pasani *et al.* (2017)¹¹⁶, only 1% to 5% of producers in various nodes of fish production and marketing were women; approximately 70% of local brokers were women, of whom nearly 90% were native processors; 2% were wholesale and intermediary traders; and approximately 60% were exporters, but none of them were transporters. These findings were consistent with those of Mussa *et al.* (2017)¹¹⁷ who concluded that more than 70% of casual trade across borders in the SADC region is conducted by women and that in Southern Africa. Cross-border fish traders were also notably youthful (that is, from 60% to 80% of traders operating across the Zambia-Malawi border were less than 40 years of age).

In the past, Chirwa *et al.* (2005)¹¹⁸ and GoM (2010)¹¹⁹ observed that even though several government entities improve national policies for rural development and design policy frameworks to help rural people become organized, service delivery can be channelled through various types of farmer organizations or groups in the historical context. These rules also lay the groundwork for farmer organizations to provide input, marketing, and instructional services to farmers (Stockbridge *et al.*, 2003)¹²⁰; GoM (2019).¹²¹ However, many extension agents lack the necessary skills and training for community development (Dorward *et al.*, 2008¹²²; Kaunda & Chimatiro, 2019¹²³). Hence, some extension agents have been using shortcut ways to build farmer organizations, while others explain government policies to rural communities in an oversimplified manner, which undermines the justification for the policies and creates divergences in terms of accountability, leadership, and governance within the farmer organizations.

Consequently, a lack of solidarity among youths or women in their community associations and malfunctioning governance structures, create an environment of mistrust and animosity within farmer organizations and subsequently lead to their failure to deliver benefits to their members and to remain sustainable (Shiferaw *et al.*, 2009¹²⁴; Rout, 2013¹²⁵). Njera *et al.* (2017)¹²⁶ and Munthali *et al.* (2022)¹²⁷ thus recommended the active, structured participation of youths and women (*Madzimai*) if aquaculture is to be promoted in Malawi. This was after they surveyed 732 farms in 10 districts: Nkhata Bay and Mzimba (Northern Region), Ntchisi, Nkhotakota, and Mchinji (Central Region), and Phalombe, Thyolo, Mulanje, Machinga, and Zomba (Southern Region), where it was seen that female participation in key positions of the Aquaculture value chain was still in the infant stages.

In many parts of Malawi, *Madzimai* (women) and youths lament the scarcity of crucial inputs such as fingerlings and fish feed, particularly the more effective floating fish feed. Imported feed is becoming more expensive due to high import levies imposed to reduce dependency on all foreign inputs (Mwema *et al.*,

2021)¹²⁸. Furthermore, no indigenous species that is more viable and effective for aquaculture has been discovered. Since the restriction on some exotic species, such as the common carp, fish producers have been asking for another suitable replacement, which would raise income and hence incentivize the viability of aquaculture in the country (Kassam & Mtethiwa, 2017)¹²⁹. This adversely affects female and youthful fish farmers, while discouraging others from venturing into the business. Similarly to the capture fishing industry, they suffer post-harvest losses because of infrastructural deficiencies during fish processing, storage, marketing, and transportation (DEPD, 2019⁸⁶; Torell *et al.*, 2020⁹³).

The intricate human interactions that occur during catching fish, processing, and marketing have an impact on women’s ability to effectively participate in the value chains within the aquatic ecosystem. In Malawi, the value chain for fish begins with fishing and continues with processing, marketing, and transportation. How men and women participate in the fish value chain differs according to culture, politics, and economics. Thus, compared to women, men engage in more value-adding processing activities. While men are primarily responsible for transporting fish, either by driving automobiles to other places or by paddling boats on behalf of fish customers, women sell firewood for fish processing (Chiwaula *et al.*, 2012)¹³⁰.

In a recent assessment of the gender equity advancement in Lake Malawi’s small-scale fishing industry, Torell *et al.* (2021)¹³² added to prior studies by arguing that women play significant, however frequently unseen, roles in the sector. Their study covered seven districts along Lake Malawi’s shoreline. They looked at how women’s access to and control over fisheries resources are shaped by the reproductive and lucrative duties that men and women play in fishing communities. Torell *et al.*’s (2021)¹³² work, remains the most recent information on the topic and advances our knowledge of how to support women’s involvement in the fishing industry. It was learned that whereas land and lake resources are available to both genders, their functions are different. People’s access to and control over shared resources are shaped by social norms and values. Table 4 below describes the findings of Torell *et al.* (2021)¹³² in the seven Lakeshore districts of Malawi.

Table 4 shows the fish value chains and gender roles in Malawi’s Lakeshore districts (Torell et al, 2021)¹³².

Value Chain Role	Who Engages in Value Chain Role?		Dominant Gender	Summary of General Feedback Provided by FGD Participants as to Why One Gender Dominates or Not *
	M	W		
Boat captain	14	0	Men	Women don't have the strength, technical and leadership skills.
Fisher/crew	12	0	Men	Women don't have the know-how; men have more energy; sometimes men fish while naked.
Boat driver	12	1	Men	Women don't have the skills.
Boat owner	14	11	Both, but mostly men	Anyone with money can own a boat.
Gear owner	14	12	Both, but mostly men	Anyone with money can own gear.
Gear and boat maintenance	14	0	Men	Women do not have the skills.
Fish carrier	9	13	Both, but mostly women	It is an easy job. Women have the skills; men are tired after fishing.
Middleman buying fish from the beach	13	13	Both, but mostly women	Anyone with money can buy and sell fish.
Owner of processing equipment	13	13	Both	Anyone with money can purchase processing equipment.
Fish processor	12	12	Both, but mostly women	It is an easy task that can be done by anyone.
Fish processing helper	12	14	Both, but mostly women	It is an easy task that can be done by anyone.
Vehicle driver	14	2	Men, very few women	Women don't have the skills and fear driving.
Wholesaler	13	13	Mostly men, some women	Men own larger operations. Cultural system does not allow women in wholesales.
Middleman buying from processors	13	11	More men than women	You need money and skills. Some men own marketing places and women are left out.
Retailer	13	14	Both, but more women	Everyone is capable of being a retailer, but there are more women than men because women are business oriented.
Consumer	14	14	Both	Everyone eats fish.

* Notes: The number of responses at each value chain role depends on the number of FGDs that recognized this role. The maximum is 14 as that was the number of FGDs held. The last column summarizes consensus feedback related to why men or women dominate a specific value chain role. More granular detail is provided in the subsequent sections.

3 d. Zambian capture fisheries and aquaculture value chains

As with crop agriculture, the majority of capture fisheries and fish farming value chains in Zambia have all been controlled by the small-holder category, which heavily relies on family labour (ACF/FSRP, 2009)¹³³. Through capture fisheries and aquaculture, the Government of Zambia attempts to address youth unemployment problems in Zambia. Studies have shown that small-holder aquaculture is alleviating poverty, improving household food security, and consequently raising the nutritional status in rural areas, especially in comparison to non-fish farming families (Mudenda, 2006¹³⁴; Musuka & Musonda, 2013)¹³⁵. Fish products significantly contribute 53% of animal protein to the diets of Zambians, as fish consumption is rising countrywide (FAO, 2016)³. Zambia's aquaculture production has tremendously increased from about 5,000 metric tonnes in 2006 to over 30,000 metric tonnes in 2016 and to over 60,000 metric tonnes after 2020, thereby now becoming the sixth largest African Aquaculture producer (WDI, 2022)¹³⁶. This can be attributed to joint efforts by the private sector, non-governmental organizations (NGOs), and the national government.

Over the years, international donors such as the United Nations Development Programme (UNDP), the United States Agency for International Development (USAID), the Japan International Cooperation Agency (JICA), the Norwegian Agency for Development Cooperation (NORAD), the Food and Agriculture Organization (FAO), the United States Peace Corps, WorldFish, and others have played an active role in developing and supporting the rural aquaculture sector. This has primarily been conducted through what Belton and Little (2011)¹³⁷ refer to as interventionist or project-based strategies in inland Asian Aquaculture.

Although Zambia now ranks 6th in Aquaculture production in Africa and leads first in freshwater capture fisheries production in southern Africa (WDI, 2022)¹³⁶, several challenges still impede the full participation of women and youths in both sectors due to a wide range of factors, including traditions, a lack of capital investments, extension training, a lack of storage and processing facilities for prolonging shelf life, perceptions of individuals, and national and regional development programs, to mention but a few. Women (*Adzimai*) contribute to Aquaculture production by caring for ponds, feeding fish, and harvesting fish. A fish value-chain assessment in Zambia by the WorldFish Center estimated a fish supply deficit of 57,000 metric tonnes. This deficit is bound to rise with the rapidly growing national fish demand accompanied by rapidly declining natural fisheries stocks, which can thus be leveraged by increasing production from safely implemented small-holder fish farming (DoF, 2020¹³⁸, Nkhoswe *et al.*, 2023)⁸.

The Zambia Demographic and Health Survey (ZDHS) by the Central Statistical Office (CSO) and efforts of other stakeholders such as the Tropical Diseases Research Centre (TDRC) reported an increase of approximately 3% in female-headed households in Zambia between 2014 and 2018, bringing the estimates to more than 27% (CSO, 2014¹³⁹; Knoema, 2018¹⁴⁰). Further, the significant impact that accommodating women's participation in the capture fisheries and aquaculture value chains would have was justified by Sakala (2011)¹⁴¹ and CSO (2016)¹⁴², who stated that women-headed households are among the poorest, with poor living conditions and a high prevalence of food insecurity.

However, Krishnan & Peterburs (2017)¹⁴³ lament that less than 10% of the workers in the agricultural and fisheries (agribusiness) value chains are women and young people. Among the Lake Kariba fishing communities of Zambia, for instance, women dominate the value chain of fish hunting and capture (in shallow water), processing and assembly (smoking), assembly and aggregation (fresh fish), distribution to Lusaka (smoked and fresh fish), and retailing (smoked fish) (Syampaku & Mafimisebi, 2013)¹⁴⁴.

Land is one of the important aquaculture assets that rural women have limited access to or ownership over. Men typically possess other assets like shovels, hoes, and wheelbarrows that are used to build or maintain

ponds. Given the limitation of access to land and water, particularly among young women, youth participation in fish farming in rural areas is still debatable (WorldFish, 2014)⁵ due to the hardships involved in accessing loans for capital. In Zambian capture fisheries, women are not easily allowed access to fishing grounds as a fishery management practice. *Madzimai* (women) mostly have roles in fishing areas as food providers, caregivers of children and fish mongers.

A study in the Barotse flood plain, though, revealed changing trends in the activities taken up by women in the fisheries value chains (FAO, 2018)¹⁸. Women have now started engaging in fishing activities but are more likely to be traders according to findings of a study conducted to identify fish losses linked to the presence of gender-based constraints in the Zambezi River flood plains of the Barotse in Western Zambia (FAO, 2018)¹⁸.

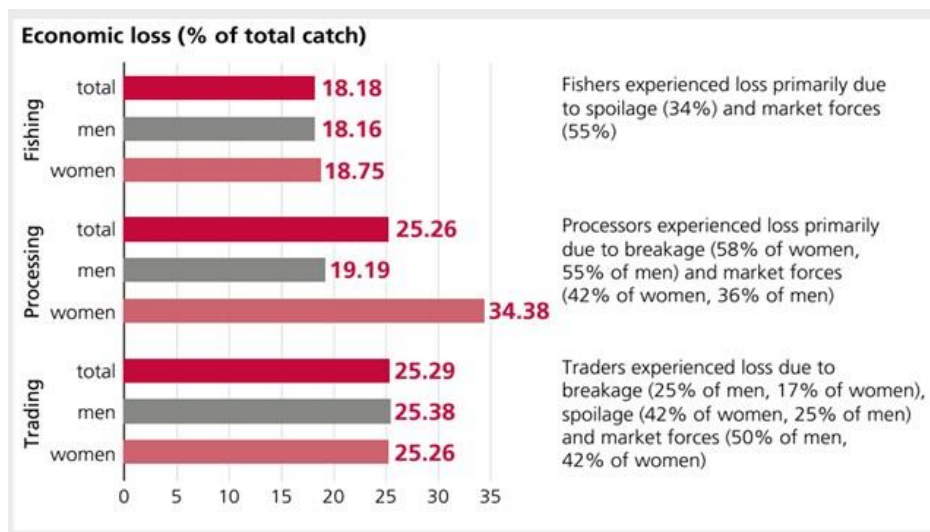


Figure 5: Long-term transformative change in the fish value chain in Zambia (FAO, 2018)¹⁸

Additionally, few women and youths in Zambia manage to obtain loans for capital using land as collateral due to their lack of ownership (Byamugisha & Ansu, 2017)¹⁴⁵. Mulenga *et al.* (2015)¹⁴⁶ focused on the contribution of the fish trade to the sustainable livelihood of female-headed households operating in three major markets in Kitwe, Ndola, and Luanshya towns in Zambia. They revealed that many female traders lacked modern skills in the processing and marketing sectors. Widowed or divorced women take up work to provide for themselves and their families. Their involvement, however, is met with barriers such as gender discrimination. Generally speaking, men’s activities dominate extractive processes, and women are often responsible for post-harvest activities, such as processing and trading, which frequently earn a narrower profit margin than that made by fish catchers (Kaminski *et al.*, 2017)¹⁴⁷.

Zambia, like most Sub-Saharan African nations, is struggling with high rates of unemployment among women and young people. Youth unemployment remains a critical challenge in Zambia. As of 2017, Zambia’s youth unemployment rate ranged from 45.5% to 51.1% (CSO, 2016)¹⁴². Approximately 60% of Zambian youths are unemployed, thus posing a substantial challenge to the nation’s future productivity, considering that more than half of its population is below 20 years of age (Mukosa *et al.*, 2020)¹⁴⁸.

Genschick *et al.* (2018)¹⁴⁹ suggest the utilization of fish farming as an entrepreneurship opportunity to offer employment opportunities to both youths and *Madzimai* (women) in Zambia.

The Zambian Department of Fisheries has thus intensified the policy implementation of the “annual fish ban” for wild fisheries during the rainy season while simultaneously encouraging engagement in aquaculture. With support from the African Development Bank (AfDB, 2023)¹², the Citizens Economic Empowerment Commission’s (CEEC) national program, known as the Zambia Aquaculture Enterprise

Development Project (ZAEDP)¹⁵⁰, is encouraging citizens, especially youths, to access loans for fish farming (DoF, 2020)¹³⁸.

Although the sector already employs approximately 13,000 people along the value chains in diverse activities including breeding, processing, and transport, there is still low youth participation in most of the provinces in Zambia. The majority of those who are engaged in fish farming are working in groups after accessing investment capital funds through the Citizen Economic Empowerment Commission (CEEC) (Kakwasha, 2021)¹⁵¹. It was also observed that farmers with other sources of income, such as wage employment or their businesses besides fish farming, were more likely to manage their fish farming activities better than those without other sources of income (Nkhoswe *et al.*, 2023)⁸.

In terms of participation, the majority of the fish farmers are over the age of 40, who are mostly retirees and are now taking up fish farming (Machina *et al.*, 2018)¹⁵². Meanwhile, Mwango *et al.* (2016)¹⁵³ reported that males predominate in fish farm ownership. Only 22.2% of women are predicted to own fish farms in the present poll, compared to an estimated 48% national participation in agriculture. However, FAO (2016)³, points out that only 16% of women in Africa own or run fish farms. Therefore, this situation is not unique to Zambia but to other countries in the SSA such as Angola, Congo DR, Ethiopia, Ghana, Nigeria, Kenya, Malawi, Namibia, Tanzania, Uganda and Zimbabwe, only to mention a few. Low women participation in aquaculture can be linked to the high investment demands and labour-intensive nature, as reported in Tanzania (Luomba, 2013)¹⁵⁴.

Moreover, access to land favours men over women. Women's engagement in fish farming is adversely impacted by a lack of accessible technologies. Women are either too poor to be proprietors of a business, are too preoccupied with traditionally branded feminine household duties to venture into their businesses fully, or are simply not granted permission from their spouses (Machina, *et al.*, 2018)¹⁵². To some extent, the studies revealed most youths perceived fish farming and fishing as an unprofitable, dirty, and laborious career, confirming most of the literature on the subject (Gellner *et al.*, 2019¹⁵⁵; Nkhoswe *et al.*, 2023)⁸. The majority rarely see the sector beyond farming. As such, they have no interest in taking it up as a long-term career. This contributes to the overall high youth unemployment rate. Most young fish farmers were identified as those who were already engaged by default (family background) but were contemplating diversifying into different sectors should opportunities arise (Fischer & Qaim, 2011¹⁵⁶; Machina *et al.*, 2018)¹⁵².

In addition to this, other developmental factors such as poor transport networks and infrastructure (storage and preservation) remain a problem in the fish supply chains, in both Zambia and Malawi, hence, the population lacks ready access to fish (O'Meara *et al.*, 2021)⁹¹. When fish reaches people from a distance (i.e., from the initial source, such as Lake Malawi), it is in the form of dry fish products. Dried and smoked fish have been shown to exhibit inelastic demand, which means that low-income customers would continue to buy fish despite rising prices since other animal protein choices like poultry and beef are not cheap (Nakwenya *et al.*, 2017)⁹⁵. This has not spared the women and youths in the value chains from greatly affecting their profits.

DISCUSSIONS

The International Labour Organization (ILO) (2007)¹⁵⁷ defines "gender equality" as fairness in treating women and men based on their respective needs. "Gender equality", in contrast, is described by the same source as the access to equal opportunities, privileges, and consideration by men and women, as well as by boys and girls, in every aspect of life. Despite many women and youths being players in the small-scale supply of fish products, impartialities still exist in the capture fisheries and aquaculture value chains. Chijoka (2017)¹⁵⁸, Marinda *et al.* (2018)¹⁵⁹ and Simmance *et al.* (2021)¹⁶⁰ suggest that further investment

in aquaculture could provide a solution to unemployment for and youths females, provide food security, but gender inequalities arise from differences in levels of education between men and women, family backgrounds, and societal values such as the seeking of a husband's approval.

Similar results were found to be cross-cutting in these selected countries, while data on youth participation still remains scanty and not in abundance. The analysis of the reviewed published data revealed that high-quality sex and age-specific data are scarce on capture fisheries and aquaculture value chains, particularly on the distribution of roles and challenges along the fish value chains for both aquaculture and capture fisheries. The review also demonstrates that research on other aspects of gendered disparities is related to social-cultural variables. The influence of gender imbalance on value chain efficiency was likewise discovered to be a domain of literature with inadequate data in all the selected countries.

It was noted that in the SSA blue-green economy, women's opportunities are unequal because (i) they do not have access to professional organizations, training, or credit, which would improve their chances of getting into traditional and entrepreneurial roles in the industry; (ii) there exists a stereotype of gender that confines women to low-wage or non-commercial jobs, usually around the house or after harvest; and (iii) they are excluded from fisheries governance and decision-making processes at all levels of management. In all four countries, women were seen to be more concentrated in lower-value processing and trading activities than the labour-intensive work in the sector.

Generally, our review shows that there are significant gender and youth issues in capture fisheries and aquaculture in Ethiopia, Kenya, Malawi and Zambia which affect their participation and empowerment. The main challenges include the socio-cultural norms, the lack of access and opportunity, the gender gap, and the low recognition of their contribution. The main opportunities include the potential for expansion, food security and income generation, and the integration of the sector into development strategies. Therefore, there is a need for more research and intervention to address these issues and enhance the role of women and youths in the capture fisheries and aquaculture sectors in the SSA. The main cross-cutting issues requiring attention can be discussed as follows:

Technical skills, and services

Other authors argued similar issues in sub-Saharan African countries that lack technical skills in fish farming, lack of fish farming inputs, poor extension services programs, and deplorable states of road infrastructure, especially feeder roads, discourage youths from participating in capture fisheries and aquaculture. Mwangi *et al.* (2016)¹⁵³ characterized this in Zambia as 'low input, low output', with little or no routine management, while in Kenya this was asserted by Lwenya *et al.* (2009)⁵⁵.

African cultural beliefs

Gender disparities in aquaculture result in decreased labour productivity within the industry as well as ineffective labour allocation at the household and national levels. Customary beliefs, norms, and unfavourable state regulatory structures limit women's access to land and water resources, assets, technology, and decision-making in many developing countries, thus limiting this group to the bottom end of supply chains in the so-called "informal" sector. This suggests that, like in crop agriculture, forestry, and industry, women are more likely to be poor in this field and are frequently barred from participation in fish farmer organizations and other areas of aquaculture governance.

The reviews in the four countries in focus — Ethiopia, Kenya, Malawi and Zambia; agreed with the findings of other researchers in other countries within the sub-Saharan, such as Ghana, where similar results were reported, as shown in Figure 6 below. Social norms in Zambia dictate that men should be the ones to engage in fishing because beliefs are held that women lack the physical abilities required for physical activity. This

agrees with the findings of other researchers elsewhere in the SSA, such as Britwum (2009)¹⁶¹ in Ghana, who asserted that traditionally, women have been the ones to provide the money needed for fuel since they are the ones who market fish and about 60% of them are working in fish processing—the point in the value chain where the majority of fish are lost (WorldFish, 2017)¹⁶².

Step	Location	Role in the system	Sex
↓	Fishing Community	Canoe owner (deciding when and how to fish)	Mostly men
		Fishing financier (pays for fuel and maintenance)	Mostly women
↓	Canoe	Fishing and maintaining equipment	Men
↓	Beach	Carriers	Mostly men
		Fish buyers	Men and women
		Carriers	Mostly women
↓	Fish processing compound	Fish processing (business owner and helpers)	Mostly women
↓	Transportation to market	Drivers and mates	Men
↓	Marketing town	Middlemen	Men and women
		Wholesaler	Men and women
↓	The fish market	Retailer (distribution)	Men and women
		Consumers	Men and women
↓	Marketing Destination		

Figure 6: Activities and roles in the chain of production, processing and distribution of fish — Adapted from Ghana’s value chain devised by Torell, et al. (2015)⁹.

Fish-for-sex transactions

Based on the findings reviewed, many challenges were seen to be cross-cutting in the sub-Saharan African countries. For instance, a host of literature reports “*sex-for-fish*” transactions, such as by Bene & Merten (2008)¹⁶³ in Ethiopia. It has long been believed that within small-scale fishing communities in sub-Saharan African countries, female fish traders engage in sexual relationships with male fishermen (suppliers), especially in times when fish is scarce; otherwise, they wait for long hours or days to be considered. “*Sex-for-fish*” which is locally known as “*Jaboya*”, is a common practice in Abimbo village in western Kenya’s Siaya County and throughout sub-Saharan Africa (Kirui, 2017)¹⁶⁴.

“*Jaboya*” was also presented in Kenya by studies by Lowen (2014)¹⁶⁵; Nathenson *et al.* (2017)¹⁶⁶; Gunther (2019),¹⁶⁷ and Kosome *et al.* (2022)¹⁶⁸ Further, MacPherson *et al.* (2012)¹⁶⁹ and Kondowe (2023)¹⁷⁰ contended these findings earlier in the southern region of Malawi. Elsewhere, in Zambia, Merten & Haller (2007)¹⁷¹ also revealed the “fish-for-sex exchange transactions” phenomenon in the Kafue Flats as one of the challenges countrywide that women face in fish supply value chains. The authors report that this has discouraged newbies from being interested and caused husbands to restrain their wives from participating in the chains.

Further gender studies in capture fisheries indicate that women are more likely to contract HIV/AIDS because they frequently trade sex for fish or transportation (and this was also observed in Kenya as shown by Table 2 and in Malawi as shown by Table 4). These studies include “*Sex-for-fish*” and HIV/AIDS vulnerability in fishing villages in Mangochi district, Malawi, by Nagoli et al. (2010)¹⁰⁸. Studies on the susceptibility of female fish traders and fishermen to HIV/AIDS along the fish market chain in the southeast arm of Lake Malawi by Kambewa *et al.* (2009)¹⁷² support this (Figure 7). An astounding three times the national rate of HIV/AIDS prevalence was found among fishers and fish sellers, indicating the need for more research in this area.

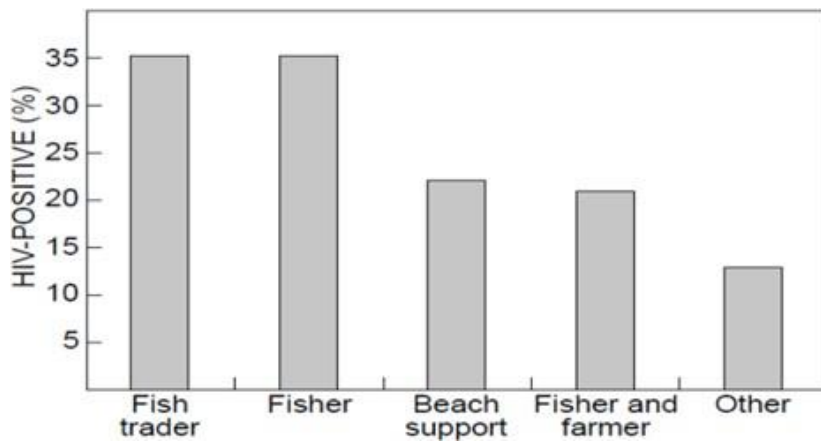


Figure 7: Results of voluntary counselling and testing for HIV prevalence in Malawian fishing communities at six health centers in Mangochi district, Malawi, January 2008 (n = 228 clients) (Kambewa et al., 2009¹⁷²; FISH, 2015¹⁷³).

CONCLUSIONS

Women and youths can sustainably harness a country’s food security through participation in the capture fisheries and aquaculture value chains. This review shows that capture fisheries and aquaculture have the potential to create employment opportunities for women and youths and alleviate food insecurity in the sub-Saharan African (SSA) countries of Ethiopia, Kenya, Malawi, and Zambia. However, women and young people face barriers ranging from factors of production to cultural norms, and gaps in governments’ policies that prevent them from fully participating in the fish value chains.

Current fish production in sub-Saharan Africa is not meeting full demand. So, improving value chains, access to micro-credit loan schemes for capital and equipment, providing necessary inputs, and extension studies can lower the supply-demand gap. The challenges in both capture fisheries and aquaculture value chains range from inaccessibility to finance, lack of access to land, tenure insecurity, poor road infrastructure, and their negative perception of aquaculture. Nonetheless, youths and women exhibit an interest in working in these value chains, but either job possibilities are limited, or they are hampered by the obstacles outlined in this review. It was seen that similar barriers constraining women and youth participation exist in Ethiopia, Kenya, Malawi, and Zambia, implying that solutions can be cross-border and upscaled in the SSA region.

RECOMMENDATIONS

Despite women and youths being the most common users of aquatic resources, they are seldom consulted in efforts to manage them. The differences in the impacts and contributions of men and women to the ecological degradation of aquatic resources are sometimes disregarded. Climate change was anticipated to aggravate these differences. Attainment of UN SDGs such as poverty alleviation (SDG 1), zeroing hunger

(SDG 2), gender equality (SDG 5), decent work for economic growth (SDG 8) and climate action (SDG 13) requires embracing gender equity and equality and youth inclusion in the formulation of national and regional policies for capture fisheries and aquaculture (Nkhoswe *et al.*, 2023)⁸. As such, from the review study, the following is specifically recommended in the sub-Saharan countries:

Introduction of aquaculture scheme for fishermen

Advocacy for fish farming among fishing communities would also lessen the pressure on wild fisheries, especially during the fish ban. Every fisherman should be registered, and incentives for aquaculture should be provided to each one of them to take up fish farming besides being commercial or artisanal fishermen. Demand for fish continues to rise in Zambia, as it is so in the SSA, due to population explosion. Musumali *et al* (2009)¹⁶ justified that the overall per-capita fish supply in Zambia, for instance, decreased from more than 11 kg per year in the 1970s to 6.5 kg by 2015 and restoring per-capita supply gap to 10kg needed an increase in yearly output of 50,000 mt which never happened. Thus, introducing “*safe aquaculture*” to fishermen would not only leverage the pressure on the overexploited capture fisheries but also increase supply. In this context, the term “*Safe fish farming*” means taking precautions so that alien species are not introduced and natural water sources such as rivers and lakes, are not polluted with effluents from fish ponds in the catchment.

Provision of extension education and encouraging investments.

As part of extension training, youths and women in capture fisheries and aquaculture should be taught about the need for savings. Microfinance banking services should be made available to them in much simpler ways that local communities can understand, easily access, and reinvest in other trades, such as integrated agricultural farming, after affordably accumulating capital. This will be a more stable and reliable way than the risky keeping of finances (money hoarding) through the “*merry-go-round*” community systems; where at times losses are incurred due to dishonesty or defaulting payments, theft, and other related factors by members. To reduce the “*fish-for-sex transactions*” to curb the spread of HIV/AIDS in the fishing communities, there is a need to establish awareness programs in communities to ponder on the risks, distribute condoms at lake shores, increase voluntary counselling to alleviate propaganda campaigns for HIV/AIDS and address the potential synergy between STIs, HIV/AIDS and waterborne diseases such as bilharzia, by early treatment.

Capture fisheries and aquaculture paradigm shift

Governments should collectively start building new perceptions of aquaculture and capture fisheries value chains for citizens to view them as employment opportunities that only require sound management. This can, for instance, be achieved by introducing fish farming training as an agribusiness entrepreneurship course in high schools and colleges. Therefore, career guidance programs should be provided to young people while they are at a tender age in primary and high schools to change their perceptions towards venturing into smallholder fish farming and capture fisheries value chains.

Favorable policies and incentives

To make aquaculture profitable, the governments, in collaboration with traditional leaders in rural areas of these respective countries, should consider lowering transaction costs, such as those for land acquisition (land titles) and water abstraction. This will promote youth access to land and their critical participation in aquaculture value chains. Women in fishing should also be protected and others encouraged to participate in the value chains by fostering gender equity through giving women priority in times of fish scarcity and coming up with capture fisheries cooperatives for only women in fishing communities to abolish trends of “*fish-for-sex transactions*” described by some authors in Kenya, Malawi, and Zambia.

Ultra-modern infrastructure, training centers and production units

There is a constant need to keep up with the pace of technology in terms of feed production, management of viable broodstock, and fingerling production. Equally, collaboration and partnerships between training centers and agro-investments in the capture fisheries and aquaculture value chains should be promoted and strengthened through graduate trainee programs and stewardship. There is also a need for the rehabilitation and construction of modern infrastructure and road networks, as well as market centers, to improve the production, processing, value-addition, shelf-life and transportation of fish products.

Closed-agroecology farming systems

While fish farming has not always resulted in significant improvements in monetary revenue, its incorporation into other agricultural operations has had significant multiplier effects on land and water productivity. Integrated Agriculture and Aquaculture Systems (IAAS) improve household livelihood security by increasing water supply management and soil erosion control when incorporated with crop farming (such as soybeans) and poultry of small ruminants (such as chickens, goats, or sheep) within the same farm. Subsequently, the use of animal waste and wastewater from ponds can serve as fertilizers in an eco-friendly closed circular system of nutrients, especially if the waste is free from residues of antibiotics and hormonal drugs that could have been administered to the animals or farmed fish, respectively. Figure 8 below shows the benefits of an integrated and dynamic agroecosystem as devised by Atreya *et al* (2021) when they studied Nepal’s traditional agroforestry systems (AFS) to justify closed farming systems, that can be harnessed in the SSA.

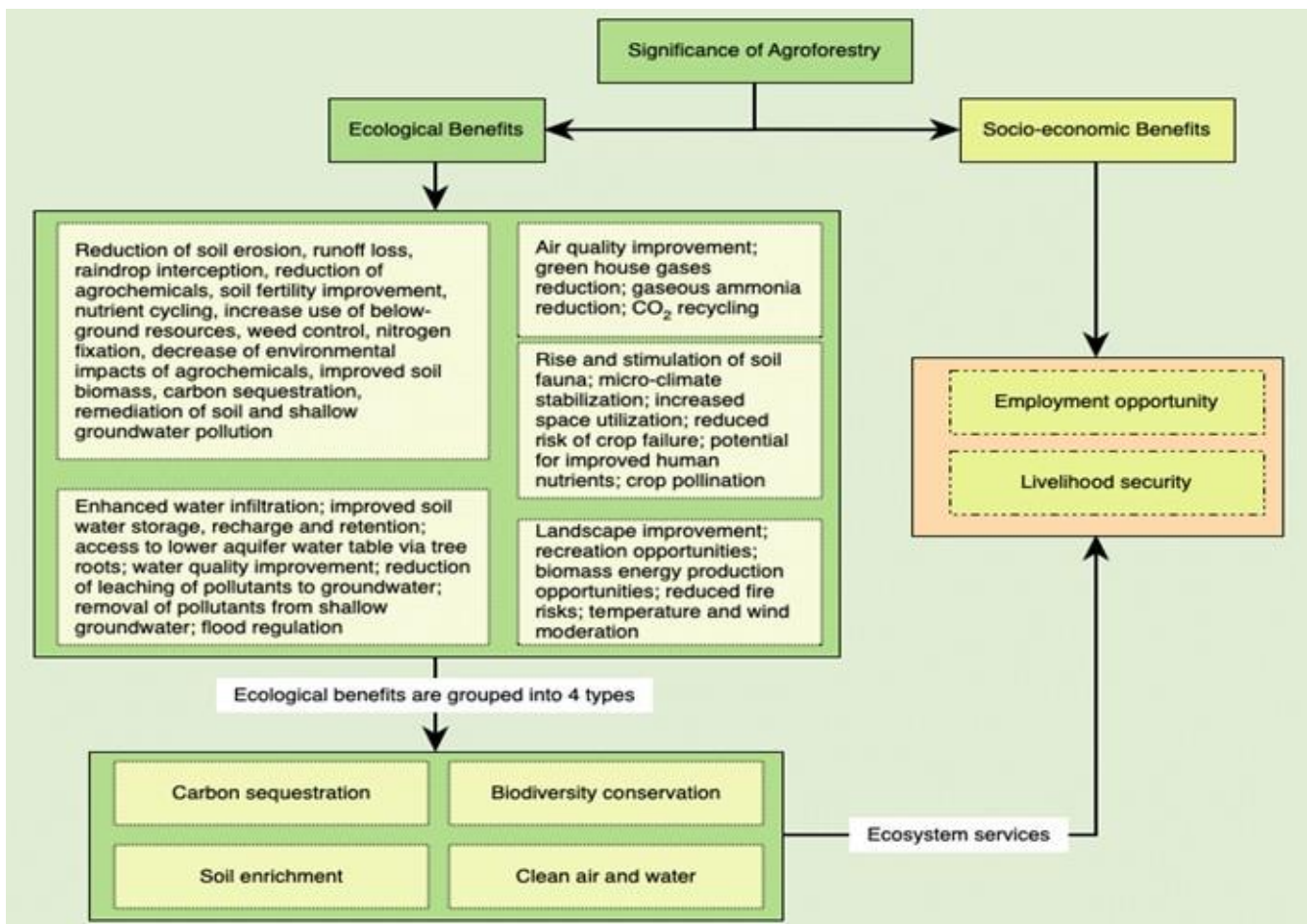


Figure 8: Significant socioeconomic and ecological benefits exist in the intentional management of trees, crops, aquaculture, and livestock as an integrated and dynamic agroeco system that SSA can harness too.

CONFLICT OF INTEREST

The authors declare no conflict of interest and no funder influenced the decision to review and publish the information.

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FOOTNOTE

¹ Merry go round: community-based microcredit hoarding system of 'village banking' whereby funds (savings) are kept and administered locally in a rotational way from one member to another rather than centralized in a formal bank.

³ Madzimai (variant: Adzimayi): common local term for Women in the Chichewa language of Malawi and Zambia.