

Women in Aquaculture: Driving Change and Empowerment

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Abstract

Aquaculture, a critical sector for food security and sustainable livelihoods, has historically been male-dominated. However, the roles and contributions of women in aquaculture are increasingly recognized as indispensable to industry growth, economic development and ecosystem sustainability. This chapter explores the evolving participation of women across the aquaculture value chain, from production to processing and highlights their contributions to economic growth, environmental sustainability and community resilience, particularly in rural and coastal regions. It also examines the challenges women face, such as limited access to resources, gender bias and inadequate training, which constrain their ability to achieve greater economic and social empowerment. Through case studies from diverse countries, including Bangladesh, India and Tanzania, the chapter illustrates how women are driving transformative change in aquaculture through innovative practices, sustainable farming techniques and collective action. State to led initiatives and policies that support women's involvement in fisheries and aquaculture are also reviewed, highlighting the need for gender-inclusive policies, resource access and capacity-building programs. This chapter examines the essential role of women in aquaculture, the challenges they encounter and their contributions to positive change, beside also features success stories from diverse regions mainly emphasizing the economic, social and environmental benefits of their efforts. Lastly it concludes by calling for stronger institutional and policy support to unlock the full potential of women in the sector, making way for a more inclusive and sustainable future in aquaculture.

Keywords Aquaculture, Empowerment, Policy, Sustainability, Women

1. Introduction

Aquaculture is prominent sector which comprises the cultivation of aquatic organisms such as fishes, crustaceans, molluscans and seaweed, has now become a vital industry for food security, economic development and

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How to cite:

Singh, A., Paul, L., Yateesh, D.C., Thengal, G., Sharma, A., 2024. Women in aquaculture: Driving change and empowerment. In: *Aquaculture Reimagined: Modern Approaches to Sustainable Fish Farming*. (Eds.) Saini, V.P., Paul, T., Singh, A.K., Biswal, A. and Samanta, R. Biotica Publications, India. pp. 229-241. DOI: https://doi.org/10.54083/978-81-980121-3-5_18.

sustainable livelihoods across the globe. Historically, aquaculture has been seen as a male-dominated sector, but the role of women in aquaculture is growing and evolving. Women's contributions to aquaculture is often undervalued and underreported as of now gaining recognition for their impact on driving change, sustainability and empowerment.



Figure 1: Woman casts fishing net in a pond

Women are not only key laborers in aquaculture but also leaders, innovators and advocates for social and environmental sustainability. They participate in every stage of fish production, processing and distribution, making significant contributions to economic growth, ecosystem conservation and providing essential support to households and communities in rural and coastal areas that represent half of the workforce, as they play a crucial role in fisheries and aquaculture industries globally (Chileya *et al.*, 2023).

1.1. Historical Context: Women in Aquaculture

Historically, the importance of women in aquaculture and fisheries has been neglected as most women stayed in roles focused on processing, selling and managing post-harvest activities, which were seen as secondary tasks. Meanwhile, men tended to take on primary roles, such as fishing and farm management. Despite being essential to the sector, women often have limited access to decision-making, financial resources and land rights simply because they are female, which restricts their ability to make a lasting positive impact on a larger scale.

As aquaculture grew to meet rising demand, women began taking on more important roles in managing hatchery operations, including breeding, rearing larvae and overseeing shrimp spawners. Over time, some women advanced to leadership roles, influencing decision-making and management in the sector. In coastal communities, their traditional ecological knowledge and

expanding roles in farm operations have become essential for the resilience and sustainability of aquaculture. This shift not only reflects changing gender roles in the industry but also highlights women's crucial contributions to aquaculture as a source of both livelihood and technical skill, showing their vital role in securing its future and supporting community well-being.

2. Role of Women in Aquaculture

Women play critical roles across the aquaculture value chain, contributing to its growth and sustainability.

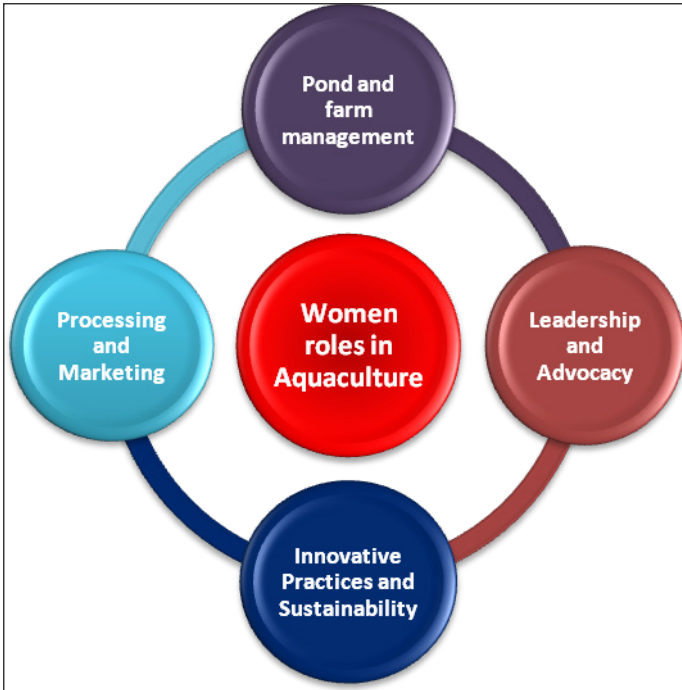


Figure 2: Different roles of women in aquaculture

2.1. Production and Farm Management

Across various regions women are involved in every part of aquaculture, from preparing ponds and feeding to harvesting and daily farm operations, especially on small-scale farms. In countries such as Bangladesh, Thailand and India, women are increasingly managing their own aquaculture ventures, which have encouraged a notable level of economic independence.

A significant example of this can be seen in seaweed farming. The industry, which started commercially in Tanzania in 1989 on the Zanzibar islands (Unguja and Pemba), has since grown to become the country's third-largest source of foreign revenue after tourism and the clove trade. Women represent a considerable portion of the workforce in this sector, with 78% of seaweed



Figure 3: Women cultivating seaweed

farmers in Zanzibar and 90% on the Tanzanian mainland being women. Although men initially participated in seaweed farming but many gradually withdrew due to the slow financial returns, leaving women as they were recognized for their patience and resilience in order to lead the labor-intensive work. Over time, women emerged as primary income earners, especially in households led by widows, divorcees and single women. This shift not only enabled them to support their families financially but also sparked a broader cultural transformation, as they transitioned from traditional domestic roles to active economic contributors. The earnings from seaweed farming have empowered these women to improve their living conditions, affording better education, healthcare and housing for their families. Similar patterns have emerged in Kenya, where commercial seaweed farming began in 2010 and is dominated by female farmers. Support from organizations like the Food and Agriculture Organization (FAO) and local development projects has boosted the involvement of women in aquaculture across multiple regions. In Mauritius and Rodrigues, women play a central role in sustainable seaweed farming initiatives, while in Madagascar, they constitute half of the farmers and workers in integrated aquaculture projects. Together, women in Tanzania, Kenya, Mauritius and Madagascar have not only strengthened the seaweed industry but have also advanced economic independence, social standing and gender equity within their communities (Msuya and Hurtado, 2017).

In India, women's participation in the seaweed industry has shown consistent

growth. As of 2004, an estimated 5,000 women were involved in seaweed-related activities, comprising half of the sector's workforce. Early cultivation experiments, primarily focused on *Gelidiella* and *Gracilaria* species, which were conducted by institutions such as the Central Marine Fisheries Research Institute (CMFRI) and the Central Salt and Marine Chemicals Research Institute (CSMCRI). These efforts paved the way for the first experimental cultivation of *Kappaphycus alvarezii* in 2002, marking a significant milestone in India's seaweed industry. Since then, numerous projects have been launched to empower women fisherfolk in seaweed farming. For example, the Tamil Nadu Women's Empowerment Project, supported by the International Fund for Agricultural Development (IFAD) and implemented by the Tamil Nadu Corporation for Development of Women, adopted a Self-Help Group (SHG) model that mandated 50% female participation. Additionally, the State Bank of India, in collaboration with the Aquaculture Foundation of India, promoted seaweed farming through SHGs, with women comprising 80% of the 540,000 groups. The National Fisheries Development Board (NFDB), established in 2006, also focused on providing women with training in seaweed cultivation. The success of women in these ventures has not only enabled them to gain social and economic independence but has also inspired men from fishing communities to follow their approach. Women's involvement in seaweed farming in India has thus become a model of empowerment, promoting industry growth and gender equity through targeted initiatives and training programs (Msuya and Hurtado, 2017).

2.2. Processing and Marketing

Women have traditionally been central to post-harvest activities in aquaculture, including processing, drying, packaging and marketing. Their skills in these areas play a crucial role in bringing aquaculture products to local and international markets, which contributes substantially to household incomes. In Africa, for example, women dominate the fish processing sector, while in Southeast Asia, they are often responsible for fish marketing channels.

Across Africa and Southeast Asia, women lead post-harvest activities like smoking, drying and selling fish, establishing their role in fish processing and marketing. In Ghana, women use the Chorkor smoker, a technology introduced by agricultural extension agents, to improve processing efficiency and enhance fish quality management. Despite the benefits, women face significant barriers, including high operating costs and limited access to credit, which impact their profitability. Similarly, in Khulna District of Bangladesh, women working in fish processing endure long hours in difficult conditions, often without adequate labour protections and for low wages. Despite these hardships, their work is vital for sustaining fish supplies in both local and global markets. Their resilience and contributions emphasize the economic importance of women in the aquaculture industry, even as they continue to face systemic challenges (Kimani *et al.*, 2022).

2.3. Innovative Practices and Sustainability

Women in aquaculture are at the forefront of sustainable innovation, using traditional ecological knowledge alongside new techniques to support environmentally resilient and economically prosperous communities. In seaweed farming and shrimp hatcheries, women combine these approaches to preserve water quality, biodiversity and ecosystem health, ultimately reducing the environmental impact of aquaculture.

A prime example is the Belize Women's Seaweed Farmers Association (BWSFA), where women lead in developing gender-transformative practices for sustainable seaweed mariculture and by developing and refining cultivation methods that reduce environmental impact, these women are addressing climate challenges such as rising sea temperatures and low rainfall. Their efforts are not only enhancing biodiversity but also improving their access to markets and promoting economic empowerment within their communities. For instance, in Zanzibar, women seaweed farmers have adopted advanced techniques like tubular nets for deep-water farming, which help them manage climate-related issues such as increased salinity and temperature fluctuations. These sustainable practices underscore the crucial role women play in advancing aquaculture's ecological and socio-economic benefits. Their efforts are fostering resilience in coastal communities around the world, despite the persistent obstacles they face. Through these innovations, women continue to lead the way in creating a sustainable future for aquaculture and strengthening local economies (Gopal *et al.*, 2020).

2.4. Leadership and Advocacy

Women's leadership in aquaculture is growing, as they advocate for better working conditions, equal pay and environmental sustainability. Women-led cooperatives and organizations are creating networks of support and knowledge-sharing that help small-scale fishers, farmers and processors increase their income and influence local and national aquaculture policies.

3. Barriers Faced by Women in Aquaculture

As women's roles in aquaculture continue to expand, they still encounter significant barriers that prevent them from realizing their full potential. Many women have limited access to essential resources, such as financial support and land rights, which are critical for aquaculture activities. Additionally, gender-biased social norms often restrict their participation in decision-making and leadership roles, limiting their influence in the industry. These barriers impact not only individual women but the entire sector. Various studies suggest that when women are fully included, aquaculture practices become more resilient, sustainable and beneficial to communities as a whole (Adam *et al.*, 2021).

Despite their growing involvement, women in aquaculture face specific challenges:

1. *Limited Access to Resources:* Women often have restricted access to

essential resources such as land, credit and technical training. Lack of land ownership, in particular, makes it challenging to secure loans or invest in expanding aquaculture businesses. Financial institutions frequently prioritize male farmers, creating additional barriers to women's economic empowerment.

2. Cultural Norms and Gender Inequality: In many societies, cultural norms and gender biases restrict women's participation in aquaculture. Gender roles often allocate household responsibilities to women, limiting their available time and energy for aquaculture work. Furthermore, women's contributions are often undervalued and they may be excluded from community decision-making processes, particularly in male-dominated settings.

3. Lack of Training and Education: Opportunities for formal education and technical training in aquaculture are often less accessible to women and this educational gap restricts their ability to adopt new technologies, implement best practices, or scale up operations. Bridging this gap is crucial for empowering women to be effective and innovative in their roles.

4. Health and Safety Concerns: Women in aquaculture are frequently exposed to health and safety risks, including exposure to chemicals, strenuous working conditions and physical strain while addressing these concerns requires improved working conditions and access to healthcare.

4. Driving Change: Success Stories of Women in Aquaculture

Despite these obstacles, women around the world are overcoming barriers and contributing to transformative changes in aquaculture. They are reshaping the industry by promoting sustainable practices that benefit both the environment and their communities. As their resilience and innovation illustrate how grassroot efforts and supportive systems can create meaningful changes.

4.1. Case Studies of Women's Resilience and Leadership in Aquaculture

The following examples highlight how women in aquaculture are advancing economically and environmentally sustainable practices, supported by training, community backing and collaborative action. By overcoming systemic barriers and advocating for their rights, these women set an inspiring example for future generations, demonstrating the power of adequate resources and support in driving change.

1. Bangladesh's Women Fish Farmers Network: In Bangladesh, the Women Fish Farmers Network empowers women to engage in shrimp farming as a sustainable livelihood. Through collective action, they gain access to vital resources, technical training and financial support. Many members have adopted organic disease control and nutrient management practices, boosting both productivity and ecosystem health. These advancements have significantly enhanced their economic standing, securing better futures for themselves and their families (Choudhury *et al.*, 2017).

2. Fish Farmer Producer Groups in Bihar, India: Women in Bihar have formed

Fish Farmer Producer Groups (FFPGs), such as the Jal Jeevan Mahila Matasya Utpadan Samuh, with support from the JEEViKA rural livelihood mission. This initiative has empowered women to transform underutilized community ponds into productive fish farming sites. Despite challenges like inadequate infrastructure and limited experience, these women have successfully generated income and bolstered local food security. Training has equipped them with essential technical and management skills, though social norms sometimes limit their control over earnings, underscoring the need for ongoing efforts toward gender equity in decision-making (Bhakar *et al.*, 2024).

3. Sustainable Tilapia Farming in the Philippines: Women in the Philippines involved in tilapia farming have adopted sustainable practices that enhance productivity and economic stability. By participating in training from NGOs and local government agencies, they have improved water efficiency and reduced feed waste. Women play essential roles across the aquaculture value chain, from hatchery management to marketing, contributing substantially to family income and community welfare. Empowered by education, these women have increased their financial independence and sense of agency (Gender in Aquaculture and Fisheries, 2016).

4. Sustainable Shrimp Farming in Myanmar: In Myanmar, women lead sustainable shrimp farming initiatives that safeguard mangrove ecosystems. Supported by microloans and technical assistance from local NGOs, they have enhanced water quality management, leading to both economic and environmental gains. These sustainable practices not only help preserve vital ecosystems but also offer financial security for their families, positioning these women as guardians of both their environment and livelihoods (Aregu *et al.*, 2017).

5. Women in Small-Scale Aquaculture of the Sundarbans: In the Sundarbans region of West Bengal, ICAR-CIFRI's interventions have transformed the role of women in small-scale aquaculture, empowering them through training and resource support. A study across 10 villages revealed that women, averaging 40 years of age and often with at least a secondary education, are deeply engaged in various aquaculture activities, from pond management to ornamental fish breeding. These initiatives have nearly doubled their income from fish production, improving financial stability and breaking down socio-economic barriers. As male migration left women to manage households and aquaculture, their resilience and leadership have become crucial to the community's economic and social empowerment, showcasing the transformative power of women's involvement in sustainable aquaculture.

5. Empowerments through Policy and Institutional Support

Empowering women in aquaculture requires concerted efforts at the policy and institutional levels. Gender-inclusive policies that recognize women's contributions, ensure equal access to resources and provide training opportunities are essential for creating an enabling environment.

Governments and international organizations need to focus on:

- *Gender-Sensitive Aquaculture Policies*: Encouraging the participation of women in decision-making processes and promoting policies that address the unique challenges they face in aquaculture.
- *Access to Financial Resources*: Developing microfinance initiatives and credit schemes that specifically target women aquaculture practitioners to help them scale up their operations.
- *Capacity Building*: Investing in education and training programs that equip women with technical knowledge, leadership skills and entrepreneurship opportunities in the aquaculture sector.
- *Collaborative Networks*: Encouraging the formation of women’s cooperatives and networks to foster collaboration, knowledge exchange and collective action.

The table below provides an overview of various state-led schemes and initiatives across India aimed at enhancing women’s participation and empowerment in the fisheries sector. It highlights specific policies and programs that integrate gender perspectives and address the unique needs of women in fisheries. These include financial assistance, skill development, safety measures and entrepreneurial support, which collectively contribute to gender mainstreaming and create opportunities for women to play active roles in fisheries-related activities. Through these targeted schemes, state governments support women’s economic independence, skill-building and

Table 1: Schemes empowering women in fisheries sector across states

Sl. No.	State	Integration of gender perspectives in fisheries policy
1	Andhra Pradesh	<ul style="list-style-type: none"> • Financial Assistance for Women SHGs: Andhra Pradesh has initiated schemes that offer financial assistance to women's Self-Help Groups engaged in fisheries. These funds support the development and expansion of their fishing-related enterprises. • Matsyakara Bharosa: This welfare scheme by the Andhra Pradesh government focuses on the well-being of fishermen and their families, including women involved in fisheries. It provides financial assistance to fishermen's families during the non-fishing season, offering a safety net for economic stability.
2	Assam	<ul style="list-style-type: none"> • Assistance to women SHGs for production of value added fish products with the objective: <ul style="list-style-type: none"> ➤ Entrepreneurship in fisheries post harvest activities. ➤ Women empowerment. ➤ Promotion of value added fish product.

Sl. No.	State	Integration of gender perspectives in fisheries policy
3	Bihar	<ul style="list-style-type: none">• 60% more subsidy to women for pond construction, scampi hatchery, biofloc unit etc.
4	Gujarat	<ul style="list-style-type: none">• The Gujarat government has implemented the Sakhi Mandal Scheme to promote women's self-help groups. While not specific to fisheries, it offers financial assistance and support for income-generating activities, including those related to fisheries.
5	Karnataka	<ul style="list-style-type: none">• Reimbursement of differential interest to commercial banks From 2018-19, provision has been made for fisherwomen to avail loan from commercial/ rural regional banks upto Rs.50,000 at zero percent interest to take up fisheries activities.• Under this scheme the men or women fishers in the age group of 18 to 70 years shall be eligible for insurance coverage as below:<ol style="list-style-type: none">1. Rs.5.00 lakh against death or permanent total disability.2. Rs. 2.50 lakh against permanent partial disability.3. Rs. 25,000 against accidental hospitalization.
6	Kerala	<ul style="list-style-type: none">• Mahila Kisan Sashaktikaran Pariyojana (MKSP): It provides support for skill development, capacity building and financial assistance to enhance the role of women in fisheries activities.• Subhiksha Keralam Project: Kerala's Subhiksha Keralam Project includes measures to support women in the fisheries sector. This comprehensive project encompasses various initiatives, including skill development programs, financial aid and market linkages for women engaged in fishing and related activities.
7	Maharashtra	<ul style="list-style-type: none">• Stree Shakti Puraskar: While not exclusively for fisheries, the Stree Shakti Puraskar in Maharashtra recognizes and rewards exceptional contributions by women in various fields, including fisheries. This acknowledgment encourages and highlights the achievements of women in the sector.
8	Odisha	<ul style="list-style-type: none">• Fish Pond Yojana for Women: The Odisha government has introduced schemes that encourage women's participation in fish farming. The Fish Pond Yojana provides financial support to women for constructing and managing fish ponds, promoting their active engagement in aquaculture.

Sl. No.	State	Integration of gender perspectives in fisheries policy
		<ul style="list-style-type: none">• Mamata Scheme: Odisha has the Mamata Scheme, which aims to improve the economic conditions of women involved in fisheries. The scheme provides financial assistance to women's self-help groups (SHGs) engaged in fishery-related activities, offering them a means to invest in their ventures.
9	Tamil Nadu	<ul style="list-style-type: none">• Fishermen's Welfare Board Initiatives: The Tamil Nadu Fishermen's Welfare Board has introduced initiatives specifically designed for the welfare of women in the fishing community. These include skill development programs, financial assistance and healthcare services.• Women Component Plan (WCP) for Fisheries: The Women Component Plan is a part of the broader fisheries development plan in Tamil Nadu. It allocates a specific portion of the budget for schemes and activities targeting women involved in fisheries, emphasizing their holistic development.
10	Telangana	<ul style="list-style-type: none">• SHE Teams in Fisheries: Telangana has implemented SHE (Safety, Health and Environment) Teams in fisheries to ensure the safety and well-being of women involved in the sector. These teams focus on creating a secure working environment, addressing concerns related to harassment and providing support services
11	Uttar Pradesh	<ul style="list-style-type: none">• Funds has been allocated for marriage and also for women empowerment
12	West Bengal	<ul style="list-style-type: none">• Women-Operated Fish Vending Outlets: West Bengal has implemented schemes to establish and promote women-operated fish vending outlets. These outlets provide a platform for women fish vendors to sell their produce, fostering economic independence.• Women-Operated Fish Vending Outlets: West Bengal has implemented schemes to establish and promote women-operated fish vending outlets. These outlets provide a platform for women fish vendors to sell their produce, fostering economic independence• Matshya Sampad Bikash Yojana (MSBY): MSBY is a state-specific initiative in West Bengal that emphasizes the development of the fisheries sector. While not exclusively focused on women, it includes provisions for promoting women's participation and skill development in various aspects of fisheries.

(Source: Department of Fisheries, Various State Governments)

improved well-being within the sector.

6. Conclusion: The Future of Women in Aquaculture

Women in aquaculture are proving to be powerful agents of change, contributing significantly to the sector's economic resilience, sustainability and social transformation. By challenging traditional gender roles and overcoming systemic barriers, they are not only improving their livelihoods but also strengthening their communities. The continued empowerment of women in aquaculture requires proactive policy reforms, equitable access to resources and the support of institutions that champion gender-inclusive practices. As women gain opportunities to lead and innovate within aquaculture, their roles in supporting sustainable food production and ecosystem conservation are becoming increasingly critical. Fostering their involvement is essential for realizing the full potential of aquaculture as a sustainable and inclusive industry, driving forward food security and environmental stewardship on a global scale.

Women are driving change and empowering themselves in aquaculture, contributing to sustainable livelihoods, food security and environmental conservation. By breaking down barriers and challenging traditional gender roles, they are transforming the sector and proving that their leadership and innovation are crucial to the future of aquaculture. The continued empowerment of women through policy reforms, access to resources and institutional support is essential for harnessing their full potential and ensuring the growth of sustainable aquaculture worldwide.

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