Propelling Climate-Smart Aquaculture in Homa Bay County through Innovative Fish Farming

County:	**Homa Bay**		
Sector/s:	**Blue Economy**	**Sub-sector/Theme:**	**Innovation / Climate-smart Aquaculture**
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Target Audience:	**County Governments, development partners, policymakers, aquaculture investors**		
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INTRODUCTION

Homa Bay County, located along the expansive shores of Lake Victoria, is one of Kenya's leading blue economy Counties. With over 200 kilometers of shoreline, the county has long depended on capture fisheries for food and income. However, decades of overfishing, environmental degradation, and the growing impacts of climate change, such as warming lake waters, erratic rainfall, and fluctuating water levels, have severely depleted fish stocks and disrupted livelihoods, exposing communities to poverty, food insecurity, and economic vulnerability.

In response, the County Government, supported by development partners and national programs, has championed aquaculture as a climate-resilient, inclusive, and economically viable alternative. Recognizing that aquaculture offers a more controlled and adaptive environment for fish production, key initiatives such as the Aquaculture Business Development Programme (ABDP), Youth in

Sustainable Aquaculture (YISA), and donor-backed interventions from Echo Network Africa and Farm Africa have driven a shift from reliance on wild capture to pond and cage-based systems.

Between 2018 and 2025, over KES 1.5 billion has been invested in fisheries development, leading to the establishment of more than 1,800 fish ponds and over 250 cage units across the County. These efforts are backed by innovations such as solar-powered aquaculture systems, decentralized hatcheries, Black Soldier Fly (BSF) production for sustainable feed, and aquaponics, which together build resilience by lowering input costs, reducing environmental impacts, and ensuring year-round production.

These climate-smart practices are enabling a diverse range of community members, including youth, women, and smallholder farmers, to thrive in aquaculture despite growing climate pressures. The following examples from Rusinga Island and Muga Fish Farm illustrate how inclusive, locally driven innovations are transforming aquaculture into a climate adaptation strategy and economic growth engine in Homa Bay County.

Implementation of the Practice:

1. **Muga Fish Farm**

Muga Fish Farm demonstrates how small and medium-scale producers can integrate low-cost, environmentally sustainable technologies into aquaculture operations to improve productivity while strengthening climate resilience.

- **Hatchery development using recycled materials:** By repurposing plastic drums, basins, and bottles for incubation, Muga reduces reliance on expensive inputs and lowers its environmental footprint. This approach also reduces waste and improves access to fingerlings in a cost-effective and climate-conscious manner, ensuring a steady supply even during climate-induced disruptions to fish breeding.
- **Solar-powered aquaculture systems:** Solar energy powers aerators, pumps, and lighting, enabling uninterrupted fish production even in off-grid areas. This reduces dependency on fossil fuels, cuts greenhouse gas emissions, and ensures consistent pond conditions, especially during power outages or dry seasons when stable water quality is critical for fish survival.

Figure 1: Solar-powered aquaculture for clean energy, driving reliable fish production and sustainable farming.

- **Black Soldier Fly (BSF) production for feed:** Conventional fishmeal is expensive, unsustainable, and relies on overharvested marine resources. Muga addresses this by farming BSF using biodegradable waste. This low-input system:
  - Diverts organic waste from the environment,
  - Produces high-protein feed at minimal cost,
  - Reduces pressure on wild fish stocks, and
  - Supports circular economies that buffer farmers against external shocks such as feed price volatility or climate-induced feed shortages.
- **Aquaponics integration:** By linking fish production with hydroponic vegetable farming, Muga creates a closed-loop system where fish waste nourishes crops, and plants filter water for the fish. This water-efficient model reduces dependence on rain-fed agriculture, enables year-round food production, and is particularly suited for areas facing water stress or erratic weather patterns.
- **Training and technical support:** Muga operates as a demonstration site, offering training in hatchery management, climate adaptation, and sustainable aquaculture practices. This empowers other farmers with tools to adopt climate-resilient systems in their own contexts.

2. Rusinga Nile Perch Youth Group

Established in 2022 as a self-help group (chama), the Rusinga Nile Perch Youth Group began with just ten women in Mbita Sub- County, Rusinga Island Ward. Initially functioning as a merry-go-round to

build financial resilience, the group formalized and registered as a cooperative in 2024. This enabled them to access support and financing for commercial fish farming. Membership has now grown to 22 active women, with the youngest being 18 years old.

Figure 2Rusinga Nile Perch Youth Group's floating fish cage at Rusinga Island, supported by YISA to advance sustainable aquaculture

With support from Echo Network Africa through the Youth in Sustainable Aquaculture (YISA) Programme, implemented in partnership with the County Government of Homa Bay, the group transitioned into commercial cage fish farming, a high-yield and technology-driven aquaculture method. This support included provision of a complete cage system, fingerlings, fish feed, life jackets, a fishing boat, and climate change training.

Cage fish farming involves rearing fish in floating net enclosures placed in open water bodies such as lakes. This method allows fish to grow in their natural environment while ensuring controlled feeding and monitoring, leading to higher yields and efficient use of space. By reducing pressure on overfished wild stocks, cage farming contributes to sustainable fisheries management. Unlike traditional pond farming that may dry up during prolonged droughts, cages in open water ensure a continuous supply of fish.

The programme provided infrastructure and equipment, including fish cages, weighing scales, solar lamps, life jackets, and a fishing boat, which amounted to KES 4.2 million. Additionally, each member contributes a minimum of KES 100 in monthly savings, fostering financial discipline and internal capital growth within the cooperative.

Results of the Practice:

- Women in Rusinga Island have transitioned from vulnerable traders to empowered producers with consistent income and group savings.
- Membership growth and rising community interest signal strong potential for scale.

- Muga's use of recycled materials, solar systems, and BSF has cut costs, lowered emissions, and enhanced food production efficiency.
- Both initiatives offer replicable models for inclusive aquaculture, bridging gender gaps and attracting youth into the sector.
- The adoption of clean energy, alternative feeds, and closed-loop systems supports climate resilience and ecosystem protection.

Lessons Learnt

- Empowering communities through knowledge transfer and mentorship is critical to sustaining innovation and improving livelihoods.
- Access to finance remains a barrier, particularly for women and smallholder farmers; revolving funds and soft loans are key enablers.
- Gender-responsive interventions must go beyond production support and tackle social norms and market access to ensure lasting impact.
- Integrated farming systems like aquaponics and BSF production offer climate-smart pathways for food and income diversification.

Recommendations (*Conclusion*)-

- The County should expand access to aquaculture for women and youth by prioritizing targeted grants, essential inputs, and continuous technical support.
- There is need to integrate solar energy systems, Black Soldier Fly (BSF) production, and aquaponics into County aquaculture strategies and extension services to promote climate-smart innovations.
- There is need to establish community-based training and demonstration sites to enhance peer-to-peer learning and build local technical capacity.
- The County should consider supporting traders by facilitate aggregation, cold chain development, and direct-to-market strategies to improve profitability and reduce post-harvest losses.

Photo Gallery

Figure 3Rusinga Nile Perch Youth Group's floating fish cages at Rusinga Island, supported by YISA to advance sustainable aquaculture

Figure 4Protective nets placed over fish cages to safeguard stock from predators

Figure 5Muga's farm showcases aquaponics system, linking fish farming with vegetable production