ABDP SIAYA CASE STUDY

Climate-Smart Aquaculture, Value Chain Integration and Economic Resilience in Siaya County - Ms. Melvin Adhiambo

ABDP Level: Level 1 Beneficiary
Unique Code: 12/BON/EYI/0500
Location: Yimbo East Ward, Bondo Sub-County, Siaya County, Kenya

Executive Summary

This case study highlights the successful recovery and climate-smart transformation of a vulnerable smallholder aquaculture operation following devastating environmental shocks. By integrating renewable energy, dual-production systems (land-based ponds and open-water cages), circular feed innovations, and vertical market integration, the enterprise successfully built systemic resilience, scaling to a multi-tiered agribusiness managing over 52,000 fingerlings.

Core Challenges Addressed

♦ Climate Shocks: High vulnerability to severe weather events, exemplified by a 2021 flash flood that wiped out the farm's entire baseline investment.
♦ Input and Environmental Constraints: Prohibitive costs of commercial feeds, unpredictable rainfall patterns, and fluctuating dissolved oxygen levels during dry spells.
♦ Gender Disparities: Structural barriers limiting women's asset ownership, financial capital, and entry into commercial-scale value chains.

Technical Interventions & Best Practices

1. Climate-Smart Infrastructure: Solar-Powered Water Management

To eliminate reliance on erratic rainfall and lower operational overheads, a solar-powered water pumping system (valued at KSh 100,000) was deployed.

- ***Optimized Water Quality:*** Enabled continuous water circulation, ensuring stable dissolved oxygen levels and minimizing physiological stress in fish.
- ***Climate Decoupling:*** Secured year-round production consistency independent of seasonal droughts, while reducing carbon footprint and energy costs.

2. Strategic Asset & Production Diversification

Rather than relying on a single production medium, the enterprise diversified across both land and water systems to spread environmental and market risks:

- ***Land-Based Ponds:*** Six production ponds (230 〖" m" 〗^2 each) managed under strict Technical Integrated Management Practices (TIMPS), optimizing stocking densities, biosecurity, and feed conversion ratios (FCR).
- ***Lake-Based Cage Culture:*** Twelve commercial cages installed in Lake Victoria to scale up grow-out capacity.

Open-Water Cage Infrastructure Profile

Cage Dimensions	Quantity	Unit Stocking Capacity	Total Capacity
5 × 5 metres	4	5,000 fingerlings	20,000
4 × 5 metres	4	5,000 fingerlings	20,000
2 × 4 metres	4	3,000 fingerlings	12,000

3. Resource Circularity & Local Feed Innovation

To come around the high costs of commercial aquafeeds, the farm adopted eco-innovative input substitution:

- ***Azolla Cultivation***: Indigenous aquatic fern (Azolla) is harvested from local water bodies, sun-dried, and incorporated into feeding regimes as a high-protein feed supplement. This reduced operational costs and created a secondary revenue stream through surplus sales to neighboring farms.
- ***Effluent Irrigation:*** Nutrient-dense pond wastewater is channeled directly to irrigate high-value indigenous vegetables and kale, cutting synthetic fertilizer expenses and maximizing crop yields.

4. Upstream and Downstream Value Chain Integration

The business model transitioned from basic grow-out production into a fully integrated value-chain hub:

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- ***Upstream (Input Supply):*** Three dedicated hatchery ponds generate high-quality Nile Tilapia and Catfish fingerlings using certified broodstock, bridging the local seed deficit.
- ***Downstream (Value Addition):*** Establishment of a farm-to-fork fish restaurant to capture maximum retail margins directly from consumers eliminating exploitative middlemen.

Quantitative Performance Trends

Adoption of optimized husbandry practices (grading, predator control and daily monitoring) yielded a consistent upward trajectory in land-based production:
Pond Production Performance Tracking

Cycles	kgs	Revenue Kshs
Cycle 1	386	115,800
Cycle 2	429	128,700
Cycle 3	512	153,600

Socio-Economic Impact & Lessons Learned

- ***Household Empowerment & Governance:*** Utilizing the Gender Action Learning System (GALS) and Household Methodologies (HHM) facilitated cooperative household financial planning ensuring profits were equitably distributed and strategically reinvested.
- ***Socio-Economic Transmutation:*** The business fully funds high-tier expenditures, including university and secondary school fees for four children, while generating local employment opportunities during labor-intensive production phases.
- ***Replication Blueprint:*** This model proves that smallholder recovery programs achieve maximum sustainability when they shift away from temporary relief handouts, focusing instead on co-investment in green technology, input self-reliance, and multi-tier income diversification.

"This pond isn't just water and fish it is my family's future. Every harvest tells the story of resilience hope and the opportunities that come when farmers are given the right support to succeed." ***Melvin Adhiambo***

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