Team Aaloo

Project : The Smart Solar Lamp Revolutionizing Fish Farming

" Where Solar Power Meets Intelligent Design to Transform Rural Fish Farming "

Sector: Sustainable Aquaculture | Renewable Energy | IoT & Smart Agriculture **Category:** COMPUTING, AI & DIGITAL INNOVATION.

Abstract

Aaloo is a solar-powered, IoT-enabled lighting and monitoring system transforming Bangladesh's aquaculture sector. By replacing diesel lights with smart solar illumination, it stabilizes fish feeding, monitors key water parameters, and cuts energy costs by up to 40%. Pilot projects in Mymensingh, Khulna, and Barisal showed 20–25% higher yields, 62% less manual supervision, and ~0.5 tons of CO_2 savings per lamp annually. Supporting over 18 million livelihoods, Felight advances sustainable, data-driven, and climate-resilient aquaculture across rural Bangladesh.

Problem Statements

Fish farmers face high energy costs (25–35%) due to diesel and unreliable grid power, while irregular lighting disrupts feeding cycles, causing 10–20% yield loss. Frequent power outages hinder growth and raise costs, and diesel lamps pollute ponds with CO_2 and oil residues. Continuous manual monitoring increases labor, fatigue, and human error, reducing profitability and sustainability in rural aquaculture.

Objectives

Develop a smart solar-powered lighting and monitoring system to boost fish farm productivity and sustainability.

Key goals:

01. Replace diesel lamps with 100% solar LED lighting.
02. Automate night cycles using sensors and microcontrollers.
03. Stabilize feeding behavior with consistent illumination.
04. Enable IoT-based water monitoring for data-driven insights.
05. Ensure low-cost, locally manufactured scalability aligned with UN SDGs and Blue Economy Vision 2041.

Innovation

Hybrid Functionality:
Combines illumination + IoT monitoring in one unit.

AI-ready Architecture :
Logs fish activity and water data, enabling predictive feeding using future AI models.

Curcular Design : Uses recycled PET bottles and local materials,promoting eco-friendly,low-cost production.

Modular Scalablity : Adjustable setup — one lamp per 00–150 m^2 — for ponds of different sizes.

Low Cost: Built for tropical climates; durable, waterproof and affordable under 1500 BDT.

Impact & Sustainability

Economic :
40% reduction in operational cost; 25% increase in fish yield

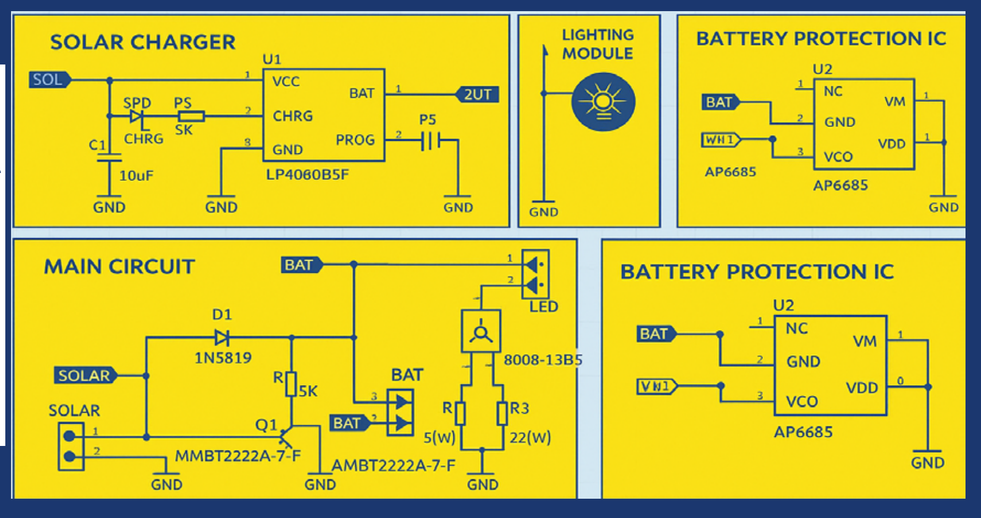
Social :
Protects aquatic ecosystems by eliminating electrical hazard and supporting natural feeding cycles

Environmental :
Reduces energy dependence and operational costs through solar-powered, zero-emission lighting

Sustainability
Encourages local innovation and scalable green technology for rural aquaculture

Aaloo Prototype implementation

Method/Prototype



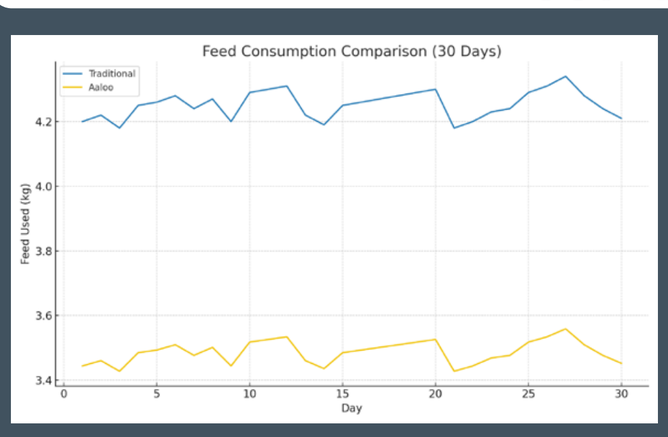
This visual shows the Aaloo prototype, combining the floating hardware unit with its support electronic circuits for solar charging, safe battery management, and automatic night lighting.

Metric	Traditional System	Felight System	Improvement
Energy Cost	450–700 BDT/mo	20 BD	80% savings
Feed Use	4.25 kg/day	3.47 kg/day	18% less feed
Growth Rate	11.2%	13.1%	+17% growth
CO_2 Emissions	~1 ton/yr	0 ton	100% clean
Insects/Night	0	~100	Natural feed
Safety	Electric Shock risk	Fully safe	Hazard-free

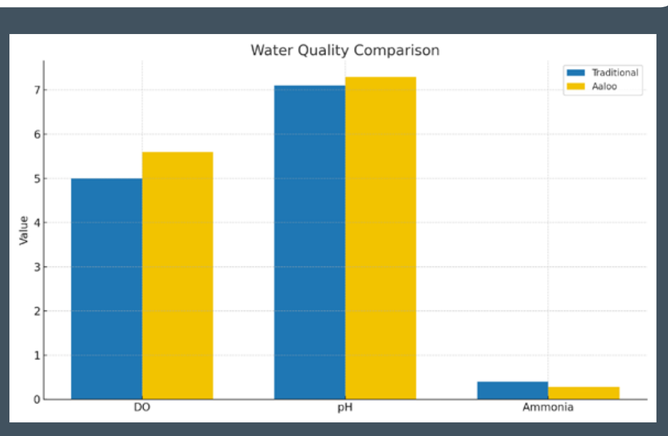
Field Prototype | Comparison Table Template | Enclosure Design (3D Model)

This image shows the Aaloo prototype,its performance comparison table layout,and the 3D-printed enclosure designs that protect the internal components and support the solar-powered lighting.

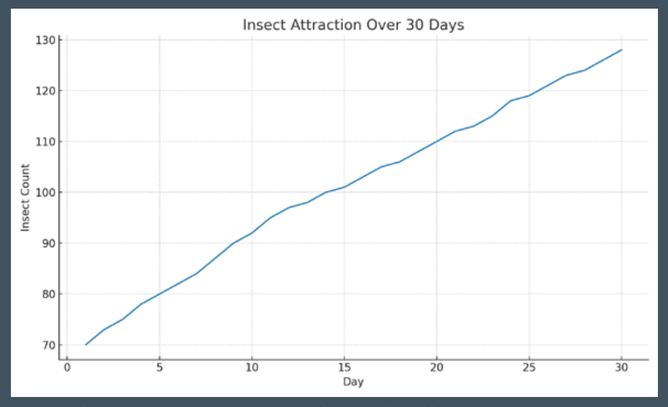
Result/ Filed Data



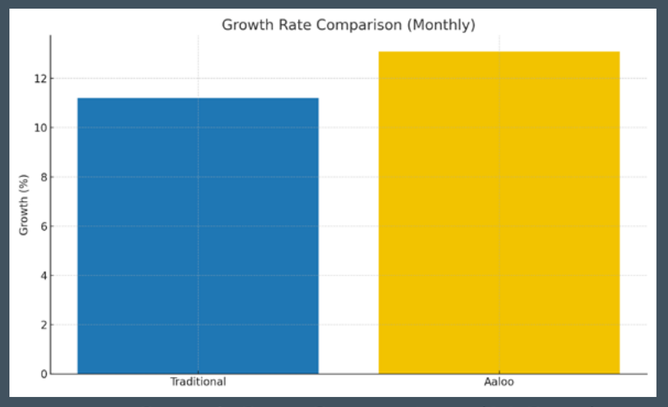
Feed Consumption Comparison (30 Days)



Water Quality Comparison



Insect Attraction Over 30 Days



Growth Rate Comparison (30 Days)

SDGs

1 NO POVERTY · 7 AFFORDABLE AND CLEAN ENERGY · 8 DECENT WORK AND ECONOMIC GROWTH · 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE · 12 RESPONSIBLE CONSUMPTION AND PRODUCTION · 14 LIFE BELOW WATER

SUSTAINABLE DEVELOPMENT GOALS

Key References

1. Vo, T.T.E., "Overview of Solar Energy for Aquaculture: The Potential," Energies (Review).
2. Mirzanovich, B.T., "Investigating Insects with Light Diode Lights for Fish Food," Peerian Journal (2022).
3. Hassan, A.S., "Evaluating the Effectiveness of LED Light Spectrums in Fisheries" (2024).
4. Benjamins, S. et al., "Potential Environmental Impacts of Floating Solar Photovoltaic" (2024) cautionary review on insect attraction & aquatic impacts.
5. Liter of Light — community solar bottle lamp program (practical design & field deployment).