Potential of solar systems on small scale shrimp farms in Bangladesh

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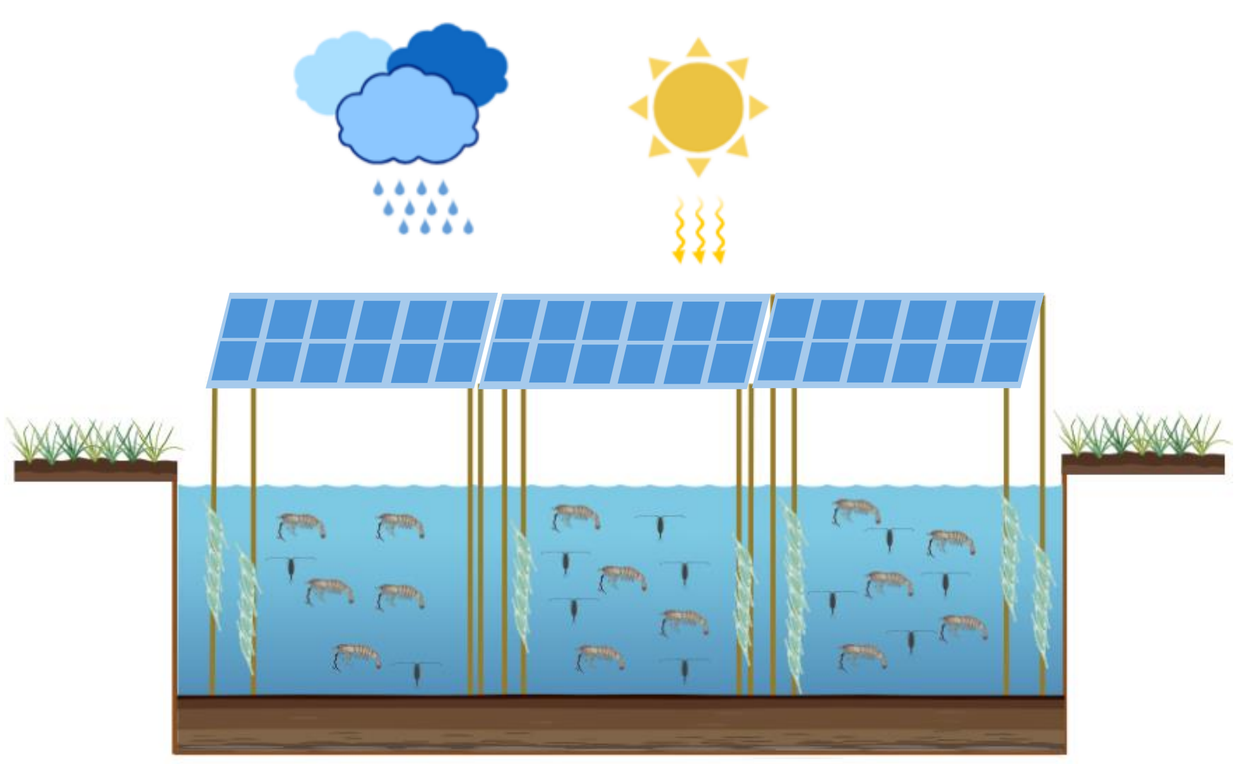
This pilot study, carried out in Bangladesh, aimed to investigate the potential effects of mock solar panels on the health of shrimp ponds and the wider ecosystem. The results contribute to an improved understanding of how partial shading of a pond could influence water chemistry, the physical ecology and food web, and shrimp growth. Hypothetical energy production was also taken into consideration to estimate the overall benefits.

INTRODUCTION

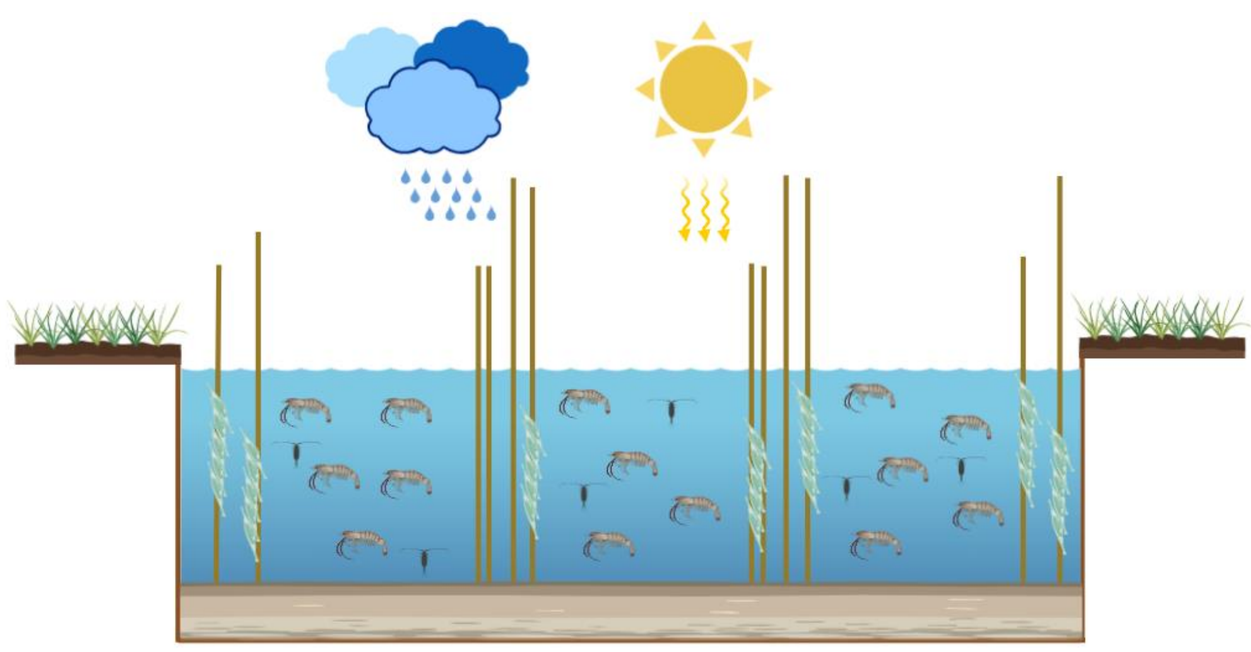
Aquaculture is a high-energy demand sector and relies on the use of external energy throughout the supply chain, from production to product distribution. Energy consumption varies considerably across the value chain and according to the culture system, with intensive farming being the most demanding. In most countries, the main energy sources used to produce electricity are coal, and fossil fuel derivatives, while only a small number also rely on renewable sources. Renewable energy, such as solar or wind, represents an alternative to mitigate the environmental impact of current practices.

METHODS

- Two 0.12 ha ponds:
  1) **Experimental pond:** 44% covered by mock solar panels made of bamboo covered by black polyethylene sheeting.
  2) **Control pond:** Comprising only bamboo poles to neutralised the effect of periphyton growth.
- **20-week experimental period** to represent the production cycle of an extensive farming system.
- Shrimp post larvae (pl) were stocked in each pond at **8 pl per m^{2}.**
- **Water quality** parameters, **primary production**, **shrimp productivity**, and **total bacteria** and ***Vibrio* counts** were measured.



Experimental pond
- More diverse planktonic community and food web
- Reduced proportion of pathogenic bacteria
- Reduced temperature fluctuation
- Reliable healthy crop production
- Production of electricity



Control pond
- Reduced food web complexity
- Higher proportion of pathogens
- More photosynthetic activity
- Greater temperature and pH fluctuation
- Crop health outcomes less reliable

RESULTS

Compared to the control pond, the experimental pond with mock solar panels had:

- **Greater planktonic and microbial diversity** in the water column.
- **Higher survival rates** and **increased productivity.**
- **A reduction in total photosynthesis** and diversity of autotrophic and heterotrophic planktonic communities.

Results suggest that solar panels positioned over a pond can improve productivity and have environmental benefits.

CONCLUSIONS

This pilot study has successfully provided insight into how shading from solar panels can improve the health and sustainability of shrimp farming.
To build upon these findings, future research needs to develop a more comprehensive long-term experiment, with appropriate levels of replication and % pond coverage, to evaluate the economic viability and impacts of installing solar panel structures over shrimp farms.

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