

Sustainability impacts of ecosystem approaches to small-scale aquaculture in Bangladesh

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Aquatic Food Systems

- Aquatic food systems are diverse and provide various environmental, economic, and social benefits.
- Recognized globally for their nutritional value and contribution to aquatic biodiversity, they play a crucial role in sustaining healthy diets.
- Today, they offer promising solutions to improve global food security, enhance livelihoods, and protect the environment.
- Compared to other animal food systems, they have, on average, a lower carbon footprint and fewer environmental impacts.
- Aquaculture offers a potential solution, but also presents environmental challenges, particularly in developing countries.



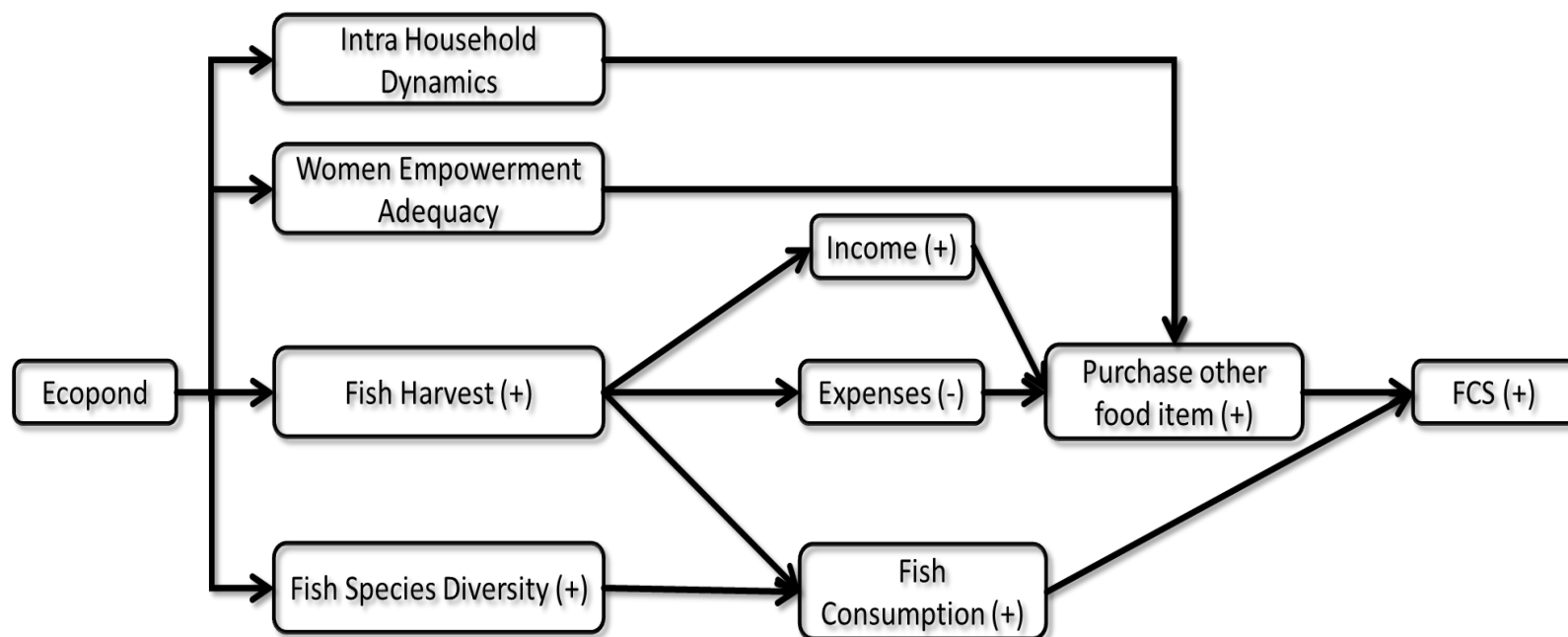
Bangladesh

- **Demand:** aquatic food is essential for meeting the growing demand for animal-based protein.
- The national population has higher annual per capita fish consumption than the global average, with fish accounting for as much as 60% of animal-based protein consumption.
- **Production:** Bangladesh has a very high aquaculture output, currently ranking as the 5th largest in the world.
- The aquaculture sector has expanded substantially in the past decade and plays a major role in the livelihoods and food security of a large fraction of the population.
- Inland ponds are now the single largest source of aquatic food in the country and account for 94% of the total national aquaculture output.
- Roughly 4.3 million households (20% of the rural population) operate at least one homestead pond that is usually small in terms of size (0.08-0.10 ha on average).



The EcoPond Model

- **Definition:** The ecopond model involves the use of underutilized homestead ponds, usually managed by women, employing natural materials to enhance fish habitats.
- The ecopond approach was conceived during preliminary participatory action research with women in four communities located in two polders in Khulna District.
- **Key components:**
 - Use of bamboo, aquatic vegetation, and other local materials to create a sustainable fish habitat.
 - Training and capacity-building for women on pond management.
 - Focus on subsistence fish production with potential for surplus sales.
- **Objective:** this simple and affordable ecosystem approach to aquaculture can leverage the potential of underutilized ponds for small-scale fish production to improve fish productivity, household income, and women's empowerment without compromising ecosystem services.



Main Objective: To assess the sustainability impacts of the ecopond model in Bangladesh.

Fish Productivity: Assessing changes in fish diversity and productivity.

Income Generation: Evaluating the impact on household income, especially from fish sales.

Food Security: Analyzing the effect on dietary diversity and fish consumption.

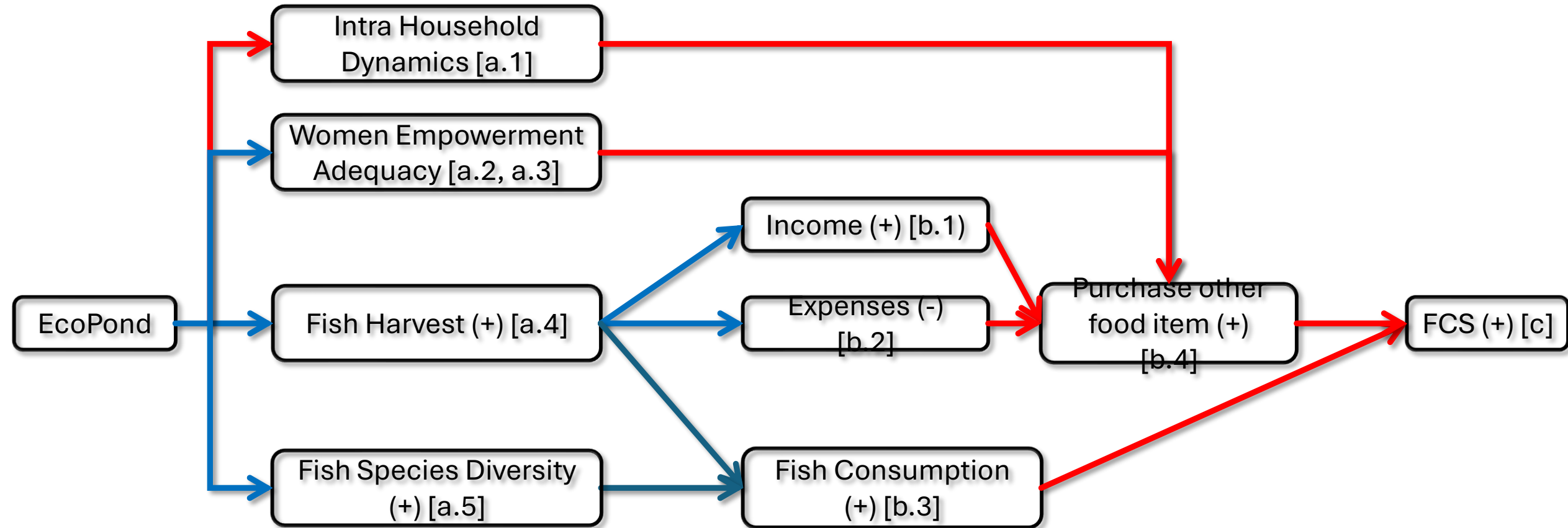
Women's Empowerment: Exploring changes in women's roles, decision-making, and control over resources.

Methodology

- **Approach:** Interdisciplinary, mixed-method design.
- **Study Sites:** Conducted in Khulna and Barguna districts, covering multiple communities.
- **Participants:**
 - **Ecopond Groups:** Households with women trained in ecopond management.
 - **Control Groups:** Households with similar ponds but without the intervention.
- **Comparison Groups:**
 - **Ecopond vs. Control:** Households with only underutilized ponds.
 - **Ecopond+ vs. Control+:** Households with both underutilized and other types of ponds.



Ecopond theory of change.
Expected pathways to improve household food security (diet diversity)



→ Not supported by the outcomes

→ Supported by the outcomes

Summary of Ecopond outcomes

Ecopond Treatment	Study Site 1				Study Site 2				Total	
	Ecopond		Ecopond+		Ecopond		Ecopond+		Ecopond	
	Result	Sig.	Result	Sig.	Result	Sig.	Result	Sig.	Higher (%)	Sig. (%)
[a.1] Intra-household dynamics	↓	-	↓	-	↓	-	↓	-	○	-
[a.2] WEAI	↑	-	↑	-	↑	-	↑	-	●	-
[a.3] HH with women empowerment adequacy	↑	×	↑	×	↑	×	↑	✓	●	◐
[a.4] Increase Ecopond harvest (per decimal)	↑	✓	↑	✓	↑	✓	↑	×	●	◐
[a.5] Increase in fish varieties	↑	✓	↑	×	↑	×	↑	✓	●	◐
[b.1] Higher income from ecoponds (per AE)	↓	✓	↑	×	↑	✓	↑	✓	◐	◐
[b.2] Decrease expenditure on fish (per AE)	↑	✓	↑	×	↑	×	↑	✓	●	◐
[b.3] Higher fish consumption (per AE)	↑	✓	↑	×	↓	×	↑	✓	◐	◐
[b.4] Purchase other food items (per AE)	↓	✓	↓	✓	↓	×	↓	×	○	○
[c] Higher Food Consumption Score	↑	×	↓	×	↑	×	↓	×	◐	○

↑ = Outcome higher than its respective control group

↓ = Outcome lower than its respective control group

✓ = Outcome significantly higher/lower than its respective control group

× = Outcome not significantly higher/lower than its respective control group

○ = 0% (0 cases)

◐ = 25% (1 cases)

◑ = 50% (2 cases)


● = 75% (3 cases)

◉ = 100% (4 cases)

- Across all cases the fish variety, ecopond production, and women empowerment are higher compared to their control groups
- While in most cases fish consumption is higher, in none of the cases this led to a significantly higher Food Consumption Score (FCS)
- While most mechanism to achieve higher FCS are in place (higher income from ecopond and lower expenditure on fish products), this didn't translate into spending more on other food items (a key factor to achieve a higher FCS)

Focus Group Discussion to understand why the diet diversity did not improve despite an increase of household income

	FGD1	FGD2	FGD3	FGD4	FGD5	FGD6	FGD7	FGD8
Diet priorities								
Food quantity	Medium	Medium	High	Medium	Medium	High	Low	Low
Eat preferred food	High	High	High	Low	High	High	Medium	High
Nutrition	High	Medium	Low	High	High	Low	High	High
Expenditure priorities								
Children education	High	Medium	High	High	High	Medium	High	High
Increase productivity	High	High	Low	High	High	High	High	High
Healthcare and welfare	High	Medium	Medium	Medium	Low	Medium	Medium	Medium
Food diversity	Low	Low	Medium	Medium	Low	Low	Low	Low

 = High priority
 = Medium priority
 = Low priority

Even though there is an overall understanding of the value of a preferred and nutritious diet and its prioritization over absolute quantity, it seems that other priorities within the household takes precedence. In particular, participants across all FGDs articulated a lower priority towards spending any extra income for diet diversification. Instead, education and increased productivity are viewed as the main priorities, as one participant mentioned “*spending the extra income on increasing productivity will give me more profit. Then I can use the profit for family welfare*”.

Thank You

