Comparison of shrimp farming systems: Evidence from Bangladesh

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Introduction

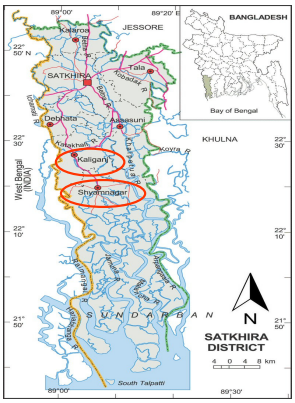
Black tiger shrimp (*Penaeus monodon*) is one of the most popular species for aquaculture in many of the tropical and sub-tropical countries. Shrimp aquaculture is growing in Bangladesh as it provides quick profit and it contributes to economic development. The growth of shrimp aquaculture in the country is ascribed to its suitable climatic conditions and the availability of resources such as feed, seed, water and a cheap labour force. Shrimp aquaculture has a long history in Bangladesh and farmers' traditionally practice conventional and integrated shrimp farming. Despite the quick profit and economic development, shrimp aquaculture has had considerable environmental costs and negative socio-economic impacts. Hence, shrimp aquaculture has been criticized by environmental and social scientists in terms of unplanned non sustainable expansion. The doubts about the sustainability of shrimp aquaculture are surfacing. As a reaction of negative impacts, organic shrimp aquaculture is now recognized as an alternative farming system. Consequently, organic shrimp project has been introduced in Southwest region of Bangladesh in 2005.

Objectives

- To understand the potential causes for expansion of organic shrimp aquaculture in Bangladesh;
- To understand the sustainability of shrimp farming comparing conventional, integrated and organic cultivation practices.

Hypotheses

- Organic shrimp aquaculture achieves higher yields than conventional and integrated aquaculture.
- Organic farmers earn higher incomes from shrimp than conventional or integrated farmers.



Red circle showing study site (source: Banglapedia, 2003)

Organic shrimp (Photo: Brojo)

Shrimp pond (Photo: Brojo)

Table 1: Basic characteristics of conventional, integrated and organic shrimp aquaculture systems in Bangladesh (Source: based on field survey)

Criteria	Conventional aquaculture	Integrated aquaculture	Organic aquaculture
Farming techniques	Polyculture (shrimp and fish)	Polyculture (shrimp, fish and rice)	Polyculture (shrimp and fish)
Stocking density	High (3-5 post larvae/ m^2)	Medium (2-3 post larvae/ m^2)	Low (1-2 post larvae/ m^2)
Dependency on feeding	Natural and supplementary	Natural and supplementary	Natural
Uses fertilizers	Organic and synthetic	Organic and synthetic	Organic
Uses pesticides	Yes	Yes	Prohibited
Uses antibiotics	Yes	Yes	Prohibited
Sources of post larvae	Wild and hatchery	Wild and hatchery	Hatchery
Uses species	Native and exotic	Native and exotic	Native
Mode of water exchange	Sluice gate and pump	Sluice gate and pump	Sluice gate

Methods

- Study site: Kaligonj and Shyamnagar sub-districts in southwest region of Bangladesh
- Sample size: 144 organic, 60 conventional and 60 integrated farmers
- Structured and semi-structured questionnaire interviews
- Focus group discussions
- Transect walks
- Data analysis: SPSS and Ms Excel

Results

Table 2: Comparison (arithmetic mean) of shrimp aquaculture in three different farming systems

Variables	Organic farmers (n = 144)	Conventional farmers (n = 60)	Integrated farmers (n = 60)	All farmers (n = 264)	Significance level
Shrimp (kg $ha^{-1}year^{-1}$)	319.6[a]	226.4[b]	195.6[b]	270.28	**
Monthly income (US$)	481.2[a]	387.7[b]	243.3[c]	405.89	**
Cultivation in own land (ha)	0.85[a]	0.54[b]	0.47[b]	0.69	*
Wage labour (Permanent)	0.69[a]	0.48[b]	0.08[c]	0.50	**

Significance level: * = $p \leq 0.05$; ** = $p \leq 0.01$; ns= not significant. Same superscript letters of each row indicate no significant difference at $p<0.05$.

Table 3: Mean quantity of inputs by the sample respondents in three different shrimp farming systems

Inputs	Mean quantity (kg/ha/yr)			Significance level
	Organic (n = 144)	Conventional (n = 60)	Integrated (n = 60)	
Urea		71.43	99.23	**
TSP		116.19	128.53	**
Cow dung	1022.27	1338.55	1220.24	ns
Compost	138.07	182.77		*
Lime	94.64	123.79	90.51	ns
Rice bran	42.23	39.89	48.87	ns
Mustard oil cake	75.53	106.59	52.48	ns
Pesticide		0.15	1.76	**
Bleaching powder		0.11	0.51	**

Significance level: * = $p \leq 0.05$; ** = $p \leq 0.01$; ns= not significant.

Conclusions

The prospects of organic shrimp are positive considering yield, income, land and labour suitability, and input use. The adoption of organic shrimp farming as an alternative cultivation system in Bangladesh may help minimizing environmental and social problems. The success of organic shrimp farming depends on farm characteristics and the farmers' willingness to strictly follow the principles of organic farming.

Acknowledgement

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References (A complete list of references can be obtained by the Author)

Paul, BG, Vogl, CR (2011) Impacts of shrimp farming in Bangladesh: challenges and alternatives. Ocean Coastal Management 54(3):201-211.