



Can shrimp farming unlock a sustainable future

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- Bangladesh faces severe climate risks that threaten to undermine the country's recent development progress in growth, poverty reduction, and human development.
- Landowners/operators have responded to increasing groundwater salinity by converting rice paddies into shallow saltwater ponds, which can be used to cultivate shrimp and other saltwater fish.
- We conducted 10 focus group discussions and a survey of 739 shrimp cultivators and rice farmers in southwestern Bangladesh to document (i) that knowledge of climate change is high, (ii) conversion of rice paddies to shrimp ponds is costly, and (iii) those working in agriculture are concerned about shrimp cultivation increasing saline intrusion into nearby plots.

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Introduction

Climate change poses a significant threat to the livelihoods of low-income individuals worldwide, particularly those working in agriculture. In the context of this project, the coastal districts of Bangladesh are predicted to be especially vulnerable to climate shocks. Because the country is low-lying, coastal, tropical, and a large share of the population works in agriculture, Bangladesh is vulnerable to a wide range of climatic events, including floods, droughts, erosion, and sea-level rise, among others (World Bank, 2022). Government estimates indicate that by 2051, one in seven people in Bangladesh will be displaced due to climate change (Bangladesh Ministry of Foreign Affairs, 2022). To avoid large-scale displacement in the next two decades, it is critical to develop a better understanding of the feasibility of adaptation methods available to those on the front lines of climate change.

One such promising form of adaptation that may provide better outcomes for those living near the southwestern coast of Bangladesh is shrimp farming in saltwater ponds, also known as *ghers*. As sea-level rise drives increases in groundwater salinity, yields from traditional rice varieties decline, reducing incomes for farmers. However, landowners and operators may respond to the increased salinity of available water by flooding their land with this newly saline water and instead cultivate shrimp, using either wild-caught fry or fry purchased from hatcheries. Although the transition from rice farming to shrimp cultivation requires considerable financial and human capital investment, it provides an instructive case study of climate adaptation.

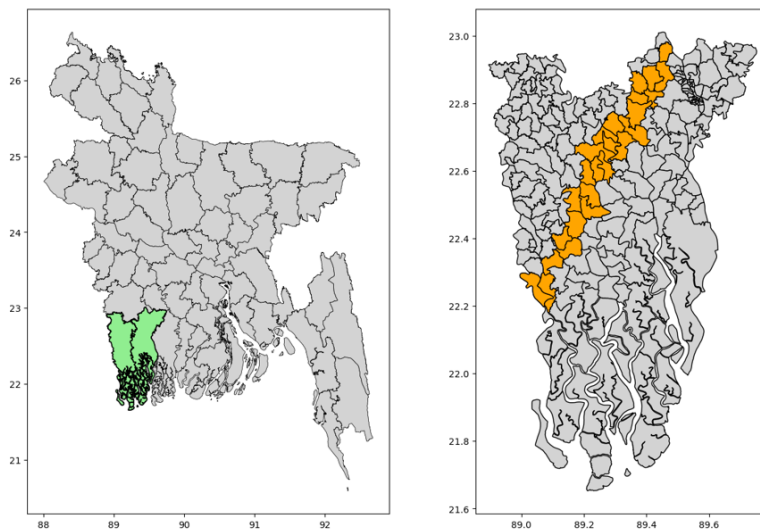


Figure 1: Survey locations in Bangladesh

The pros and cons of shrimp cultivation

First, shrimp cultivation allows people to adapt in situ to changing climate conditions rather than making the risky choice of migrating to cities. In situ adaptation is also an important objective for policymakers as the large-scale movement of people into cities may lead to overcrowding, congestion, or other unfavourable outcomes.

Second, while rice farmed in this region is primarily cultivated to be sold at local or regional markets, 20 to 40% of shrimp produced in Bangladesh is for export (Mamun, 2021). A local climate shock harms rice farmers even if their crops are spared because local buyers of the crop are still affected. By contrast, shrimp demand is influenced by international markets. Since shrimp is largely exported, demand will not be driven by local shocks, but instead in part by demand shocks in the importing country. If we expect that shrimp export demand is uncorrelated with demand shocks in southwestern Bangladesh, then the switch from rice farming to shrimp cultivation may act as a form of insurance.

Third, shrimp farming may allow people to work with, rather than against, the changing climate. Better information on when to switch to shrimp farming may help farmers avoid years of declining rice yields and profits.

However, it is important to note that shrimp farming is unlikely to be a silver bullet against climate change in this region. Shrimp farming may be more volatile than rice farming due to disease outbreaks and poor cultivation techniques. Second, differences in the labour intensity of shrimp cultivation relative to rice farming may lead to lower wages for those working in shrimp farming, post-switch. Likewise, those least able to migrate may work in such casual shrimp jobs (for example, women and low-income individuals). Third, there may be negative production spillovers onto those who remain in rice if nearby shrimp cultivation leads to increased saline intrusion.

To evaluate these pros and cons, we draw from a series of focus group discussions with shrimp farmers, workers, and other stakeholders conducted in March and April of 2024, as well as a survey of approximately 739 shrimp cultivators and rice farmers in salinity-affected regions conducted in May and June of 2025.

Project findings

We observe four main findings from the focus group discussions. First, discussants believe in climate change and report witnessing both increases in temperature and increases in salinity. Second, they report that rising salinity is a primary cause of the increase in shrimp farms. Third, there are concerns about the distribution consequences of shrimp farming. One common belief is that

because shrimp cultivation requires less labour, the profits may more often fall into the hands of elites. Fourth, those with experience in shrimp cultivation report that saltwater used for their ponds could have externalities for those operating rice plots in nearby areas.

Saline aquaculture externalities worry farmers

Shrimp cultivators in Shyamnagar spoke with us about their decisions to leave rice farming once salinity made it no longer viable:

- *“Later on, the [rice] cultivators gave land to shrimp farmers because the paddies were not growing well and salt water was coming in.”*
- *“The situation of the land deteriorated for 1 to 2 years as salt water entered the land.”*

In the survey component of the project, we find that while shrimp cultivators and rice farmers are balanced in age, gender, and education, the former group has 37% higher earnings. It is also notable that in this setting, 78% of respondents report the highest level of climate concern on our scale. In keeping with the qualitative findings on externalities, we find that 95% of respondents expect that the conversion of a neighbouring plot from paddy to saltwater *gher* would increase the salinity on their land, and 98% expect that this would decrease yields.

Survey respondents also report that converting land from agriculture to shrimp plots is costly. The average respondents report that converting their plot would take over three weeks. Only 18% of those surveyed say that they currently have enough savings to cover the cost of the conversion; however, 75% believe they would be able to take out a loan to cover the associated costs.

What does this mean for policy?

These findings suggest that adaptation policy should simultaneously mitigate spillovers on remaining rice producers (for example, salinity-tolerant varieties, drainage, and embankment maintenance) and ease barriers to efficient switching where appropriate (for example, targeted credit, phased cost-sharing, and technical support). Supporting households on both margins – those who adapt in place and those who transition – will be critical to safeguarding livelihoods as salinity intensifies.

References

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- World Bank. (2022). *Bangladesh: Country Climate and Development Report*.