



Economic Feasibility of Integrated Shrimp-Mangrove Farming in Charakria Sundarban




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Background



Fragile Economy

- Climate change threatens the country with the loss of life and resources and a fragile economy
- Given this, a climate resilient economy became a priority for the country-
 - to make livelihood climate resilient,
 - so that, its economy becomes insulated from climate change in one way or another, and
 - development become sustainable.


Background



Forest Loss

- Bangladesh has around 9% forest coverage as opposed to around 14% in 1990.
- An estimated 2,000 hectares is depleted annually.
- About 20,000 hectares of CHT forest land is being shifted to agricultural cultivation.
- During 2000-2010, mangrove decreased at a rate of 0.032% a year


Background



Fall of a whole forest- CSB

- The locals were provoked to grab the 10,000 year old Chakaria Shunadarban (CSB).
- The British Government leased 1600 ha of land to landless families for their settlement in 1926.
- Again 2251 ha was leased to shrimp farming in 1977.
- Another chunk measuring 694 ha was replaced with shrimp in 1982.
- The World Bank ('Shrimp Culture Project', World Bank Credit No. 1651 BD) and UNDP provided a USD 26.5 million fund support for conversion of the largest chunk of CSB, about 3577 ha, to shrimp farming.


Background



Consequences

| Date | Max wind speed (km/hr) | Death toll (1000) | Homeless (Million) | Economic Loss (Bill USD) | Main affected districts |
|---------------------|------------------------|-------------------|--------------------|--------------------------|---|
| 11 May, 1965 | 161 | 20 | -- | -- | Barisal |
| 15 Dec, 1965 | 217 | 1.0 | -- | -- | Cox's Bazar |
| 01 Oct, 1966 | 139 | 1.0 | -- | -- | Noakhali |
| 12 Nov, 1970 | 224 | 300 | -- | -- | Bhola |
| 25 May, 1985 | 154 | 11 | -- | -- | Noakhali |
| 29 Apr, 1991 | 225 | 139 | 10.5 | 2.4 | Cox's Bazar, Ctg |
| 19 May, 1997 | 232 | 0.2 | 1.0 | 2.0 | Cox's Bazar, Ctg |
| 15 Nov, 2007 (SIDR) | 223 | 3.4 | 3.5 | 1.7 | Bagerhat, Pirojpur, Bargun, Pathuakhali |
| 25 May, 2009 (AILA) | 92 | 0.3 | 1.0 | 0.6 | Satkhira, Khulna |

Background




Consequences

- Conversion of CSB deprived the locals from availing tones of forest benefits they used to get in the past.
- It has been estimated that, at least 10,000 lives could be saved alone in Chakaria in the 29th April 1991 if CSB were in place [total killed 16,705].
- Salinity has increased which has made some land to be put no use.
- The shrimp monoculture is now experiencing serious yield problem due to bacterial infection.
- Shrimp-based livelihood is now at a stake and probably is not climate resilient.


Background

so, WHAT IS THE FIX?



Background


this study, WILL ADDRESS THIS ISSUE



Hypothesis

New research and premise for step forward

- In some parts of the world such as the Gulf of Fonseca and El Salvador, the cost of conversion of mangroves to alternative uses (such as shrimp farming) has been estimated.
- Benefits available from natural sustenance of mangrove have surpassed the benefits available from all other alternative uses.
- In Vietnam, organic shrimp farming as an admixture of mangroves – mangrove aquaculture- has shown significant shrimp yield and mangrove growth.



Hypothesis



Hypothesis

- We hypothesize that, the Vietnam success can be replicated in CSB which will:
 - Ensure sustainable growth and yield of organic shrimp.
 - Make the CSB settlers' livelihood climate resilient.
 - Since the idea is farming shrimp while growing mangroves, CSB can slowly be brought back to its original condition.

Objectives



- To evaluate the economic feasibility of mangrove aquaculture in CSB
- To test people's willingness to accept mangrove aquaculture in CSB
- To compare the climate resilience of settlers' livelihood based on existing and alternative scenarios.
- To suggest if the idea is extendable to other mangrove areas given the success of the present study.

Justifications




- If found successful, mangrove aquaculture ensure climate resilient livelihood and thereby it will boost the country's economy.
- The study will produce a new set of data and method for the researchers and policy makers of the country.
- If CSB can be restored, it will ensure a wide range of environmental benefits, a sink of carbon a great shield against natural disaster.

Methodology

Study Site and Sampling Framework


- The survey will be kept limited within the CSB settlers.
- Villages will be selected using a stratified random sampling procedure.
- From the selected villages, the households will be stratified based on income groups.
- From each income group 5-10 % households will be selected and surveyed.



Methodology

Data

| Variables | Data sources |
|---|-------------------|
| Demographic information | Primary data (PD) |
| Past and present rates of forest dependency | PD and SD |
| Costs and risks of shrimps and mangroves | Projected |
| Past, present & projected income & their source | PD and SD |
| Preference for the project (Yes/No) | PD |
| Historical data on disasters and employments | SD |
| Climate change and environmental awareness | PD |
| Shrimp farmers' farming experience | PD |
| Mangrove nursery and plantation experience | PD |
| Area available for mangrove and shrimp | PD |
| Cost involved in bacterial infection and remedy | PD |
| Soil and water sample test cost | PD |
| Floral and faunal diversity of CSB | SD |




Methodology

Analytical Framework

- **WTA analysis:** To evaluate people's willingness to accept this project idea, we will estimate the following logistic model:

$$\text{Preference (YES=1, NO=0)} = \alpha + \beta_i X_i + e_i$$
 where, X_i is the vector of socioeconomic variables
- **Factors affecting yield of shrimp:** To estimate the marginal impact of each socioeconomic variable (X_i) on the yield (Y) of shrimp, we will be using the following model:

$$Y = \alpha X_i^{\beta_i} + e_i$$




Methodology

Analytical Framework

- **Risk of yield loss analysis:** Following OLS model will be estimated to measure the potential risk for yield or income loss (Y_L) attributed to factors (X_i) affecting yield in each scenario (Ha el al, 2013).

$$Y_L = \alpha + \delta_i D_i + \beta_i X_i + e_i$$

Where, D_i is a vector of dummies for each land-use type.
- **Benefit- Cost analyses:** B-C analyses will be conducted for each of the alternative land uses following Gammage (1997).




Methodology

Analytical Framework

- **Climate resilience livelihood analysis:** An OLS model will be estimated to test the sensitivity of income and income sources given the prevalence and intensity of disasters


$$Y_p = \alpha + \beta_i X_i + e_i$$

where, Y_p is the income from source P , and X_i is the number or intensity of climate change disasters.



Expected outcome

- One deliverable of the project will be to produce a comprehensive table on socio-economic condition of the people of the study site
- The study will answer whether the idea of integrated mangrove-aquaculture will be economically feasible.
- An answer to people's WTA the idea of integrated mangrove-aquaculture will be established.



Expected outcome



- Is the existing non-mangrove livelihood at CSB climate resilience? The study will answer this question.
- Overall, the B-C ratio for existing livelihood and for mangrove-aquaculture will be compared.

Time management



| Activities | March-2015 | April-2015 | May-2015 | June-2015 |
|------------------|------------|------------|----------|-----------|
| FDG and map prep | | | | |
| Data collection | | | | |
| Data analysis | | | | |
| Dissemination | | | | |
| Report writing | | | | |

Questions and Comments

