



# Sustainable Aquaculture in Mangrove Ecosystem (SAIME)

An ecosystem-based, climate adaptive,  
biodiversity-friendly aquaculture  
practice in Indian Sundarban





# BACKDROP

## Need:

Restoring mangroves in a community participatory approach integrating it with good aquaculture practices striking a balance between aquaculture and mangrove conservation in the context of climate change induced sea level rise establishing a transformative change in the existing aquaculture (esp. shrimp) value chain.

## Impact:

SAIME ensures a trade-off between biodiversity-friendly aquaculture-based sustainable livelihood and mangrove conservation leading to healthy mangroves, engendering coastal resilience, ensuring a thriving coastal community.

## Challenges:

Lack of policy for inclusion of land for SAIME, policy to allow mangrove pruning in SAIME farms, inadequate supply of hatchery-bred fin fish and shrimp seeds, absence of community-inclusive value chain

## Opportunity:

Significant scope for contributing to blue economy by upscaling of SAIME model in the Indian Sundarban Context.

## On-field piloting:

Successful demonstration and adoption of SAIME by 42 farmers in 29.84 hectares area in the Indian Sundarban, one at Chaital (North 24 Parganas District) and another at Madhabpur (South 24 Parganas District) since 2020



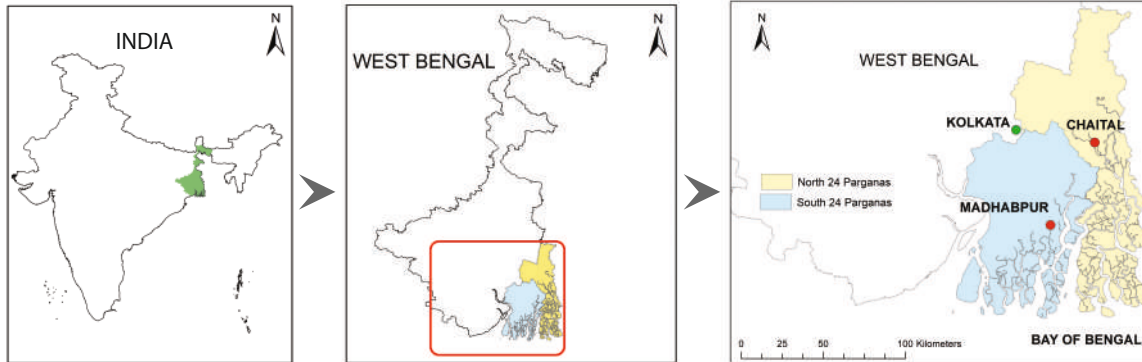
## OBJECTIVES

- To adapt a model to demonstrate a biodiversity-friendly aquaculture to build resilient ecosystem through Sustainable Aquaculture in Mangrove Ecosystem (SAIME) in the typical Sundarban context standardizing a practice of culture methodology of brackish water aquaculture integrating black tiger shrimp (*Penaeus monodon*) as a candidate species in an ecosystem-based approach and capacitating the existing brackish water farmers for the same.
- To identify the scope for reduction of blue carbon emissions associated with brackish water aquaculture through the integration of mangroves, as a major carbon-sequestering species.
- To integrate aquaculture produce from SAIME into the value chain through the formation of appropriate farmer institutions for better price realization and connect the small and medium farmers to markets - both domestic and international preferably with a brand & certification, thus bringing a transformative change for a community-inclusive value chain, thus, building a synergy between biodiversity & business
- To build Multi-Stakeholder Partnerships for implementing SAIME in Sundarban.

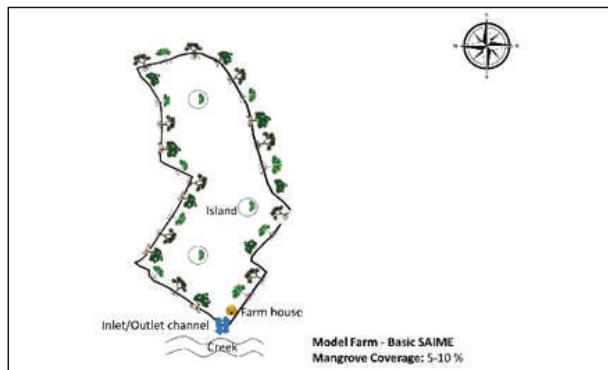




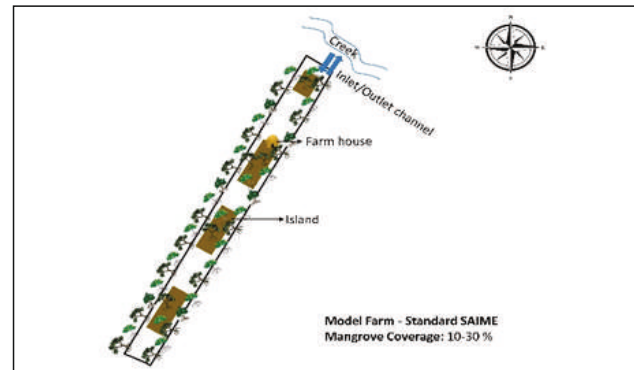
# SAIME Implementation Sites



## Strategy for mangrove integration based on farm area and mangrove coverage



Basic SAIME Model



Standard SAIME Model

**Mangrove Species Planted:** *Nypa fruticans*, *Heritiera fomes*, *Avicennia officinalis*, *Avicennia alba*, *Avicennia marina*, *Rhizophora apiculata*, *Bruguiera gymnorhiza*, *Xylocarpus moluccensis*, *Sonneratia apetala*

### Fish Species Cultured:

**Shellfish species-** Black tiger shrimp (*Penaeus monodon*) Giant Freshwater Prawn (*Macrobrachium rosenbergii*); Indian White-legged Shrimp (*Penaeus indicus*)

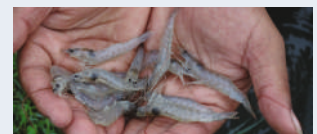
**Finfish species-** Mulletts (*Chelon pارسيا*, *Mugil cephalus*, *Liza tade*); Milk fish (*Chanos chanos*)

**Mode of culture:** Modified Extensive Polyculture with “No-exogenous feed”

**Indigenous fish species introduced for diversification-** Milk fish (*Chanos chanos*) Giant Freshwater Prawn (*Macrobrachium rosenbergii*); & Indian White-legged shrimp (*Penaeus indicus*)



Milk fish



Indian White-legged shrimp



Giant Freshwater Prawn

# Implementing SAIME by Community



Formation of Farmers' Group



Technical Capacity Building of farmers on SAIME



Building Community Governance



Development of Women-led Central Mangrove Nursery



Strengthening pond dykes for plantation of mangrove saplings



Pond Preparation



Peripheral Fencing of aquaculture ponds



Plantation of mangrove saplings on the pond embankments



Stocking of hatchery-bred SPF shrimp and fish seeds



## Monitoring of Mangroves and Water Quality Parameters



Growth monitoring of mangroves



Measurement of pH



Measurement of salinity

## Growth Monitoring of Shrimps and Fin Fishes



Growth Monitoring of  
black tiger shrimp



Growth Monitoring of mullets



Growth monitoring of  
Giant Freshwater Prawn

## SAIME Farms with Well Grown Mangroves





## Harvest of Shrimps and Finfishes



Black Tiger Shrimps



Giant Freshwater Prawn



Mullets

## Improving Value Chain



Sale of SAIME produce in local market



Linking of SAIME farmers' group with Badabon Farmers' Producer Company Limited (BFPCL) for better price realization



## R & D on SAIME



Study conducted by IISER to understand the contribution of mangrove leaf litter in the nutritional dynamics of SAIME ponds



Study conducted by Seacom Skills University to assess the carbon sequestration potential of mangrove sediments in SAIME farms



# Key Stakeholder Collaboration Done under SAIME



MoU between ICAR-CIBA and NEWS for technical guidance and knowledge exchange



MoU between Seacom Skills University and NEWS on Soil Carbon assessment in the SAIME farms and in the Indian Sundarban

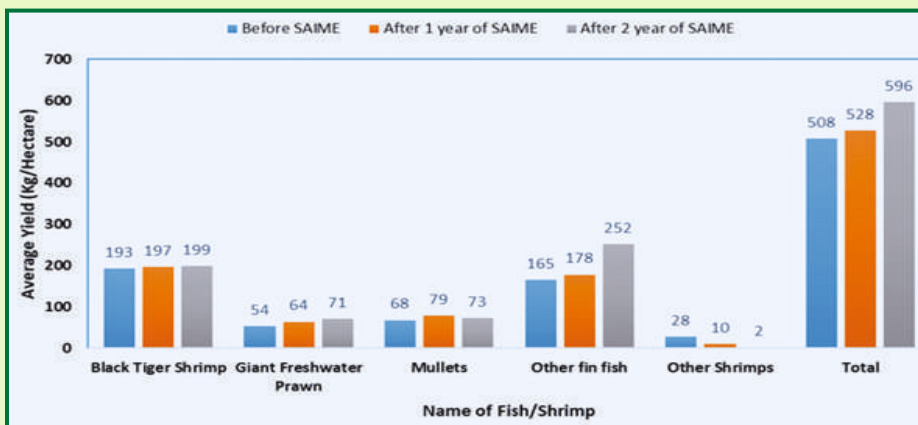


MoU between Centre for Excellence in Blue Economy (CoE-BE), IISER, Kolkata and NEWS on R & D on the contribution of mangrove leaf litter in the nutritional dynamics of SAIME ponds

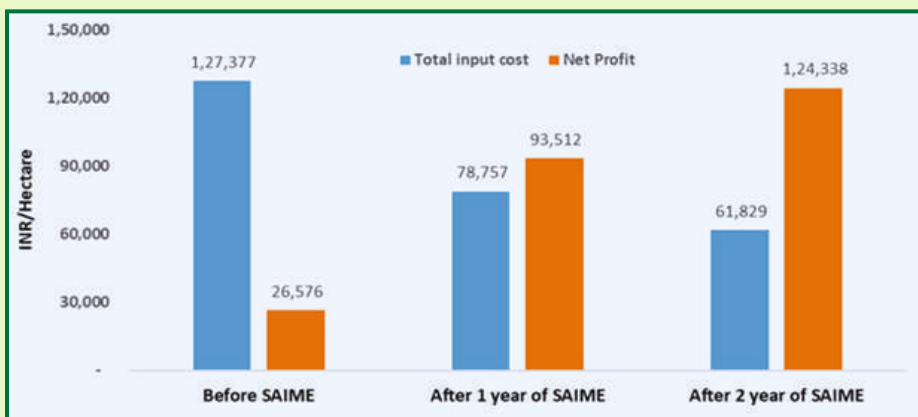


MoU between Department of Fisheries, Govt. of West Bengal and NEWS for co-funding



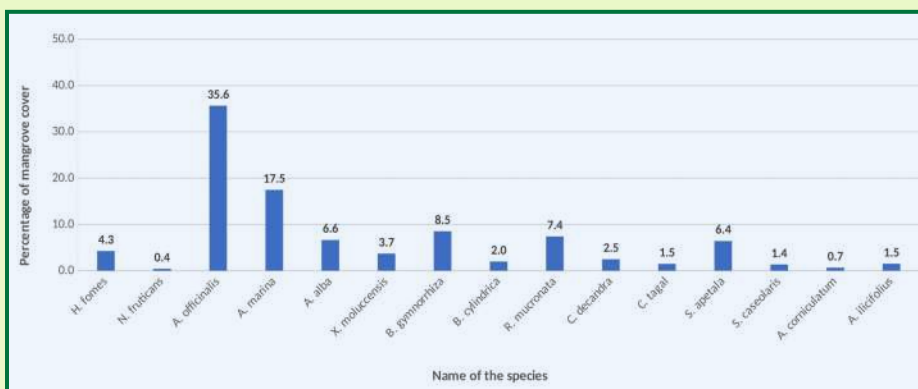


**Figure 1.** Species wise fish production after 2 years of implementation of SAIME



**Figure 2.** Comparison of average input cost and net profit earned before and after implementation of SAIME

**\*\*Average annual net profit increased more than 200% due to significant reduction in input costs especially for substituting exogenous feed by natural feed produced from mangrove leaf litter.**



**Figure 3.** Percentage wise species-specific mangrove coverage in the SAIME farms





## Major Findings

- Increase in the shrimp and fish production with both economic and environmental sustainability.
- Average yield shrimp and fish production ranges approximately from 520 - 590 kgs per hectare, out of which black tiger shrimp amounts to 182-200 kgs per hectare (Figure 1)
- Significant reduction in the recurring annual input costs like land shaping, supplementary feed due to services provided by the mangrove leaf litters.
- Increase in the average gross and net profit of SAIME farmers.
- Less Incidence of disease including White Spot Syndrome Viral Disease (WSSVD)
- The present percentage of average mangrove coverage in SAIME farms is 5.2 which is expected to increase with natural regeneration of mangroves (Figure 3)

## Way Forward

- Policy advocacy for upscaling of SAIME model in the Indian Sundarban.
- Forming Farmer Institutions to facilitate community-inclusive value chain.
- Linking farmers' institutions to avail Government schemes and access institutional finance.
- Capacitate the farmers on Post harvest management and establish post-harvest infrastructure including community-governed processing unit.
- Further R & D for better understanding of contribution of mangrove leaf litter in the nutritional dynamics of aquaculture ponds in collaboration with scientific institutes.
- R & D on scope for blue carbon sequestration in SAIME in collaboration with scientific institutes.
- Further R & D for assessment of mangrove species suitability and adaptability in SAIME farms







**SAIME ensures healthy mangroves, thriving coastal communities and a robust aquaculture value chain**





## MULTI-STAKEHOLDER PARTNERSHIP TO STRENGTHEN TRANSFORMATIVE PROCESSES IN SHRIMP TRADE AS A BASIS FOR THE PROTECTION OF MANGROVE ECOSYSTEMS IN SOUTH ASIA (SAIME)



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