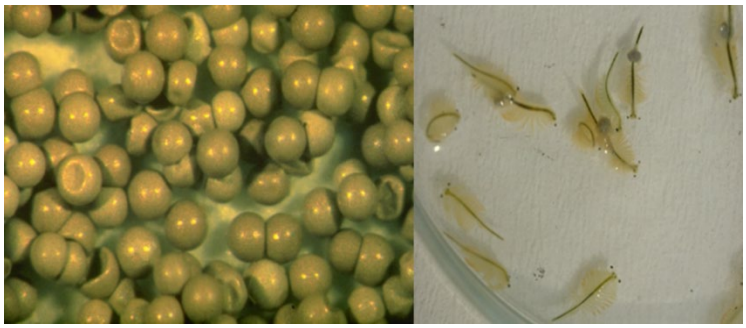
## Project objectives

The overall objective is to enhance food and nutrition security in Bangladesh through climate smart innovation. The specific objectives are to: (i) introduce an integrated salt and *Artemia* production system - not yet explored in Bangladesh; and subsequently (ii) increase marine aquaculture production and productivity.

## Background

Bangladesh is one of the most densely populated and climate vulnerable countries in the world, while the Cox's Bazar district is one of the least developed and most vulnerable regions of the country. The district historically plays a significant role in crude salt production, aquaculture, fisheries and tourism. 95% of the 1.7 million metric tons of crude salt produced each year, about 10% of the shrimp aquaculture and 80% of the shrimp post larvae produced in Bangladesh is coming from Cox's Bazar. The salt industry engages some 50,000 artisanal salt farmers and provides livelihoods to approximately 1.5 million people in Cox's Bazar. The low productivity of coastal aquaculture and the climate induced risks lead to low profitability, and limited options for livelihood improvement. Currently, salt farmers have not explored the possibility of integrated production with *Artemia* (a branchiopod) and aquaculture.



*Artemia cysts (left) and biomass (right)*

*Artemia* cysts and biomass *(Figure 1)* is mainly used worldwide as larval diet of shrimp and marine fish, and is necessary to increase the value of aquaculture. Many countries have adopted new technologies to integrate *Artemia* and aquaculture production to improve the profitability of salt farms, while Bangladesh is still fully dependent on import. Moreover, Bangladeshi salt farmers are unaware of the potential of integrated *Artemia*, salt and aquaculture production.

## The theory of change to achieve the objectives

The project aim is to increase food and nutrition security of salt/fish farmers' households. The expected outcome is the increased integrated production of salt, aquaculture and *Artemia* taking into account that climate induced hazards such as prolonged cold winters, high temperatures are potential risks. The strategy is to carry out participatory research to produce (i) improved knowledge on *Artemia* production, processing and preservation; as well as (ii) improved technologies to ensure *Artemia* and salt integrated production systems are effectively and widely adopted. The project will ensure stakeholders engagement in decision making (for example, operation and management of demonstration farms) in implementation through demonstration farms to develop integrated salt, *Artemia* and aquaculture models. Stakeholders will be involved in needs assessment, setting project priorities, preparation of work-plans and dissemination of findings to promote transparency and increase ownership in project activities.

Capacity building of domestic stakeholders (for example extension workers, young professionals) and facilitating linkages and networks among domestic and international stakeholders will increase access and availability of information and technologies to the salt farmers and shrimp/fish hatcheries. Laboratories will be established for quality assurance of the *Artemia* production. Project information

will be actively disseminated using print and electronic media. Identification of policy/regulatory issues and policy recommendations will be formulated through interaction with policy makers for sustainable integrated *Artemia* production system. Successful models of integrated production system, stakeholders' engagement, knowledge sharing workshops will promote and facilitate the scaling-up of the project findings.

These actions will decrease marine aquaculture production costs due to locally produced *Artemia* and increase the revenue of salt farmers. An impact pathway has been shown in figure 2.

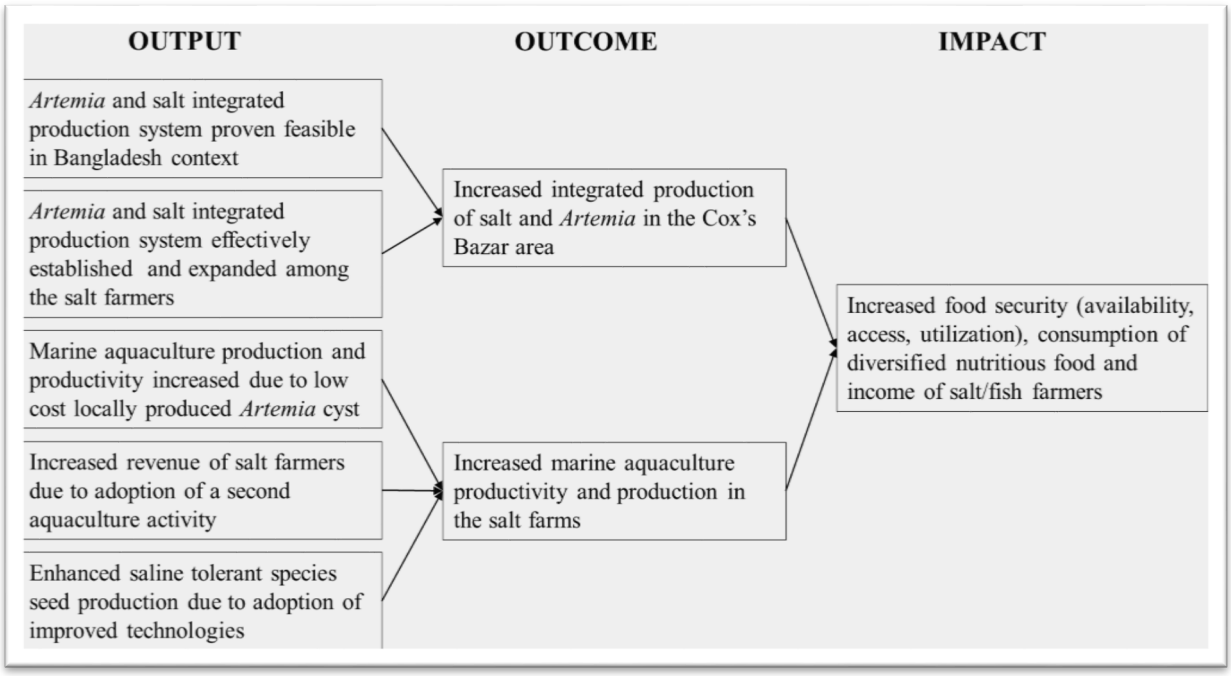



*Figure 2: Artemia4Bangladesh Impact pathway*

## Main activities

The major activities include:

- ✓ surveys to determine the current socio-economic status of salt farmers;
- ✓ selection and set up of integrated salt-*Artemia* and aquaculture demonstration farms;
- ✓ test and promotion of technologies for *Artemia* production, processing and preservation; (iv) establishment of laboratory facilities for *Artemia* and aquaculture;
- ✓ implementation of good aquaculture practice of saline tolerant species (e.g. shrimp, crab) through demonstration and training;
- ✓ identification of climate sensitive management decisions to reduce risks (e.g. high/low temperatures, out of season rainfall) in *Artemia* and aquaculture production; and
- ✓ monitoring, evaluating and disseminating of the project findings.

Capacity building through training, workshops/ seminars will cover:

- ✓ production, processing and preservation of *Artemia*;
- ✓ correct application of locally produced *Artemia* in aquaculture;
- ✓ introduction and improvement of technologies for the production of saline tolerant aquaculture species and halophytes (saline tolerant plants).

## Organization

WorldFish will be the lead agency. A Program Steering Committee, including representatives from the European Union Delegation office, WorldFish, partners and farmer representatives will ensure multi stakeholder approach in project implementation.

The work packages will be: (i) project management, collaboration with partners and stakeholders; (ii) overview of crude salt production system, scope of integration with *Artemia* and aquaculture; (iii) identification of demonstration farms; (iv) testing the feasibility, adoption and dissemination of *Artemia* and aquaculture production systems; (v) increasing marine aquaculture production and productivity through improvement of seed and production technologies; (vi) cross cutting themes covering climate smart management and gender; and (vii) monitoring pathways to impact.

**Implementing organizations**

WorldFish (International Centre for Living Aquatic Resources Management)

**Project partners**

Major International partners:

- ✓ Laboratory of Aquaculture and *Artemia* Reference Centre, Ghent University, Belgium
- ✓ College of Aquaculture and Fisheries, Can Tho University, Vietnam
- ✓ Department of Fisheries, Ministry of Agriculture and Cooperatives, Thailand

Major Domestic partners:

- ✓ Salt /fish farmers
- ✓ Crustacean (shrimp, prawn, crab) and fish hatcheries
- ✓ Department of Fisheries, Government of Bangladesh
- ✓ Bangladesh Fisheries Research Institute
- ✓ Bangladesh Aquaculture Technology Innovation Platform

**Other stakeholders**

- ✓ Bangladesh Small and Cottage Industries Corporation
- ✓ Bangladesh Frozen Foods Exporters Association
- ✓ Bangladesh Shrimp and Fish foundation
- ✓ Non-government organisations
- ✓ Shrimp Hatchery Association of Bangladesh
- ✓ The Universities involved in aquaculture and fisheries education and research in Bangladesh

**Region**

Cox's Bazar, Bangladesh

**Funding and co-funding**

| | |
|---|---|
| UE (100%) | € 3,000,000 |

**Duration**

48 months (2020-2023)