Objectives of the project

The overall objective is to enhance agricultural and food systems in the Cox´s Bazar area of Bangladesh. The specific objective is to increase productivity of salt producers and aquaculture farmers linked to *Artemia*-related innovative initiatives in the Cox´s Bazar area.

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.

Figure 1. Artemia cysts (left) and biomass (right)

The district historically plays a significant role in crude salt production, aquaculture, fisheries and tourism. 95% of the 1.7 million metric tonnes 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. Before the project started, salt farmers had not explored the possibility of integrated production with *Artemia* (a branchiopod) and aquaculture.

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 enhance agricultural and food systems in the Cox´s Bazar area of Bangladesh. The expected outcome is the increased integrated production of salt, aquaculture and *Artemia* taking into account that climate-induced hazards, such as prolonged high temperatures, erratic rainfall, cyclone, and tidal surge are potential risks. The strategy is to carry out participatory research to achieve (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 ensures 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 are 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 is expected to increase access and availability of information and technologies to the salt farmers and shrimp/fish hatcheries. The project plans to establish an *Artemia* laboratory for quality assurance of the *Artemia*

production. It is also planned to actively disseminate project information using print and electronic media. Identification of policy/regulatory issues and policy recommendations are formulated through interaction with policy makers for sustainable integrated *Artemia* production system. The strategy also relies on successful models of integrated production system, stakeholders' engagement, knowledge sharing workshops to promote and facilitate the scaling-up of the project findings.

These actions are expected to 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.

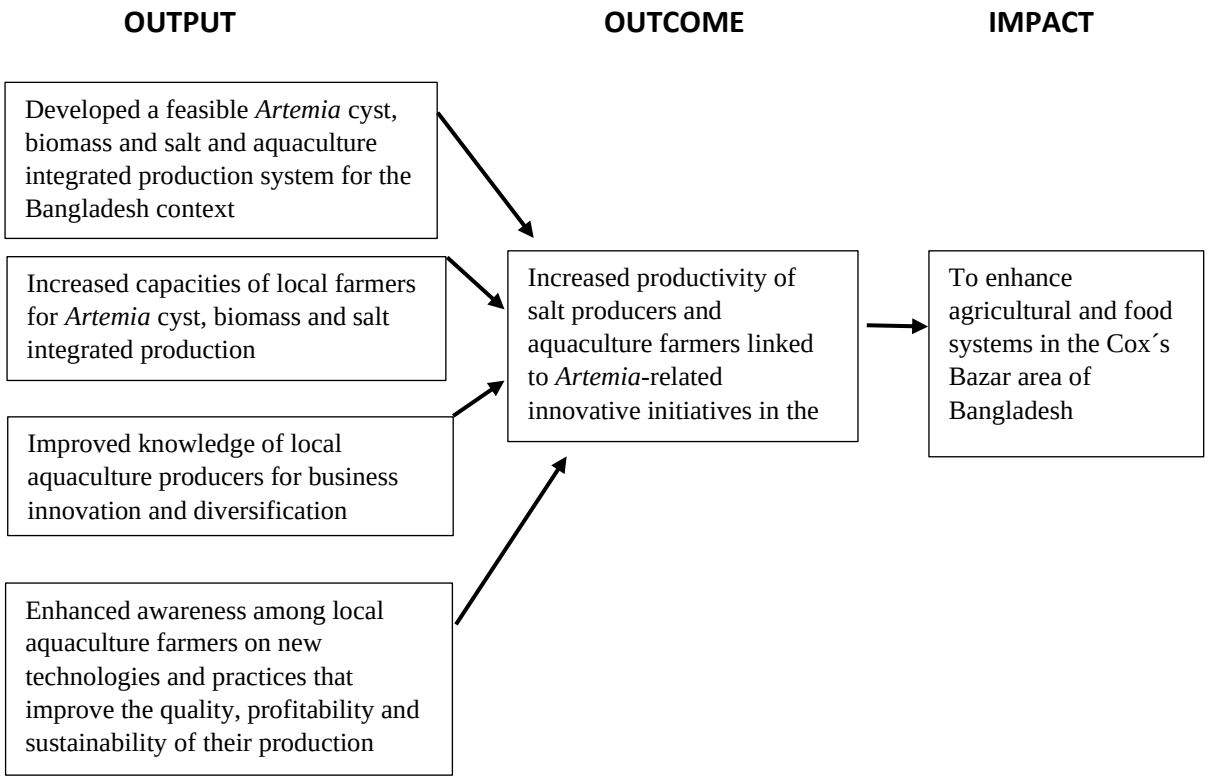

Figure 2: Artemia4Bangladesh Impact pathway

Main activities

The major activities include:

- ✓ Surveys to determine the 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;
- ✓ Establishment of laboratory facilities for *Artemia* and aquaculture;
- ✓ Implementation of good aquaculture practice of saline tolerant species (e.g. shrimp, tilapia, crab) through demonstration and training;
- ✓ Identification of climate sensitive management decisions to reduce risks (e.g. high/low temperatures, out of season rainfall, tidal surge) in *Artemia* and aquaculture production;
- ✓ Monitoring, evaluating and disseminating of the project findings.

Capacity building through training, workshops/seminars includes:

- ✓ Production, processing and preservation of *Artemia*;
- ✓ 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);
- ✓ Women participation in homestead aquaculture and vegetable gardening.

Results achieved to date (February 2023)

The major achievements of the project are:

- ✓ 117 multi stakeholder partnerships including governmental, non-governmental organizations, foreign universities, salt and aquaculture farmers, shrimp and fish hatcheries;
- ✓ Set up 42 demonstration farms for *Artemia* cyst and biomass production, 106 aquaculture demonstrations;
- ✓ Production of 8 metric tonnes (MT) shrimp, 25 MT fish and 2 MT crab in aquaculture demonstration farms;
- ✓ 1200 individuals informed on *Artemia* and aquaculture production system from the meetings/workshops;
- ✓ Set up 1 *Artemia* laboratory;
- ✓ Organized about 100 capacity development events, such as training on *Artemia* and aquaculture interventions, workshops on policy dialogue on the revision of the National Fisheries Policy-1998, international study tour, participation in the science conferences;
- ✓ Development of training and extension materials for example handbook for *Artemia* pond culture;
- ✓ Gender integration activities;
- ✓ Development of *Artemia* biomass recipes as human food;
- ✓ Development of communication and visibility materials (for example documentary videos, posters, banners, YouTube, Facebook).

The outcomes of the project are:

- ✓ Introduction of new *Artemia* and aquaculture production systems;
- ✓ Increase in aquaculture production and productivity in the area;
- ✓ Availability of locally produced *Artemia* cyst and biomass for crustacean hatcheries, nurseries, and grow out farms;
- ✓ Introduction of Recirculating Aquaculture System (RAS) in the shrimp hatcheries;
- ✓ Development of *Artemia* biomass recipes as human food;
- ✓ Increased awareness of stakeholders on climate-smart aquaculture technologies.

The results of the project are greatly beneficial for the poor salt and aquaculture farmers through new income opportunities from *Artemia* production, increased production, productivity and income from improved aquaculture systems, improved knowledge and skill on the integrated *Artemia*-aquaculture production systems to increase food security and nutrition. Women members of the salt farmers' families are engaged in income generating activities namely homestead aquaculture and vegetable gardening to bring change in their lives. The shrimp hatcheries have gained knowledge and skills on optimal use of *Artemia*, application of locally produced *Artemia* for shrimp brood stock rearing, post larvae nursing and have learnt new technologies (RAS). This ultimately increases the seed quality, increases profitability and sustainability of their business, and reduces dependency on imported *Artemia*.

Organization

WorldFish is the lead agency. A Program Steering Committee, including representatives from the European Union Delegation office, WorldFish, Department of Fisheries, Government of Bangladesh, Bangladesh Small and Cottage Industries Corporation, Shrimp Hatchery Association of Bangladesh, and salt farmers ensures multi stakeholder approach in project implementation.

The work packages are: (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

Major Domestic partners

- ✓ Salt/fish farmers
- ✓ Crustacean (shrimp, prawn, crab) and fish hatcheries
- ✓ Department of Fisheries, Government of Bangladesh

Other stakeholders

- ✓ Bangladesh Small and Cottage Industries Corporation
- ✓ Non-government organisations
- ✓ Shrimp Hatchery Association of Bangladesh
- ✓ Bangladesh Fisheries Research Institute
- ✓ The Universities involved in aquaculture and fisheries education and research in Bangladesh

Location

Cox's Bazar, Bangladesh

Funding and co-funding

EU (100%)	€ 2,500,000
Total budget	€ 2,500,000

Duration

48 months (March 2020 – February 2024)

Website

https://mel.cgiar.org/projects/1242
https://hdl.handle.net/20.500.12348/5548

Updated on 24/04/2023