Promotion of Sustainable Crab Farming in South-West Region of Bangladesh

Project Completion Report

Submitted by
Nowabenki Gonomukhi Foundation (NGF)

Submitted to
Feed the Future Bangladesh Aquaculture Activity
WorldFish

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Brief of the project

Project Title	Promotion of Sustainable Crab Farming in South-West Region of Bangladesh	
Agreement Period	Start Date: 01-02-2023	End Date: 30-09-2023
	Extension Date: DD-MM-YYYY	
Duration	08 Months	
Total Agreement Amount	US Dollar: 54,941	
Feed the Future Bangladesh Aquaculture Activity Contribution	US Dollar: 54,941	Percentage: 100%
Sub-grantee Contribution	US Dollar: 00	Percentage: 0 %
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Abbreviation

Abridged Form	Elaborated Form
BFRI	Bangladesh Fisheries Research Institute
BLC	Boat License Certificate
BW	Body Weight
CL	Carapace Length
CW	Carapace Width
DFO	District Fisheries Officer
DoF	Department of Fisheries
FO	Field Officer
GAP	Good Aquaculture Practice
MO	Monitoring Officer
MOV	Means of Verification
NGF	Nowabenki Gonomukhi Foundation
PC	Project Coordinator
PKSF	Palli Karma-Sahayak Foundation
PO	Program Officer
SUFO	Senior Upazila Fisheries Officer
UNO	Upazila Nirbahi Officer
VCA	Value Chain Assessment
WF	WorldFish

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1.0 Executive Summary

This report presents the impacts of the activities, challenges of the market actors and recommendations for sustainability of mud crab value chain in Bangladesh, from the implementation of the intervention "Promotion of Sustainable Crab Farming in the South-West Region of Bangladesh", which has been funded by Feed the Future Bangladesh Aquaculture and Nutrition Activity. The intervention was implemented in Shyamnagar upazila in Satkhira district, Koyra upazila in Khulna district and Teknaf and Chakaria upazila in Cox's Bazar district. The goal of this interventions was to reduce the pressure on wild stock for seed crab by using hatchery produced crablets and to reduce the risk of high mortality in farming to increase production.

To achieve the goal of the project different activities were conducted in the working area like capacity development training for crab farmers & nursery owners on good aquaculture practices (GAP), improved nursery & grow out management, capacity building event for hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement, Training to the hatchery technicians on crab let production at hatchery, nursery management & grow-out technology improvement, demonstration on crab let nursing technology to improve current practices for better production, demonstration on advanced crab farming technology, Carried out a trial to compare the wild crab and hatchery produced crab performance considering survivability and growth performance, courtyard meeting with crab farmers, input sellers and others for technology dissemination.

The implemented activities have reflected some major impacts in the crab sub-sector in the south-west region of Bangladesh. The undertaken activities developed technical knowledge of crab farmers which reduced the mortality of crab in different stages of crab value chain which increased the profitability of the crab farmers. The success of crablet nursing demonstration and advance crab farming demonstration engaging more crab farmers in crablet nursing and grow-out culture because of high growth rate and survivability turning into more profit than before. The comparison trial of wild juvenile and hatchery produced juvenile explored that hatchery originated juvenile possesses more growth potential than wild juvenile and as the quality of the seed stock can be ensured in case of hatchery originated juvenile so survivability rate of these are better than wild seed stock. So, this trial activity removed the confusion of the general crab farmers about the growth and survivability of the hatchery crablet and hatchery originated juvenile. Training to the hatchery technicians on crab let production at hatchery increased skill of hatchery technicians what will help to increase hatchery production and consistent seed supply to the crab farmers. However, some important decisions have also been made in linkage building workshop with crab farmers and others stakeholders to reduce harassment by law enforcement agencies.

Despite potential growth opportunities, the mud crab industry in Bangladesh facing multiple challenges that can impede its growth and profitability. These challenges include ecosystem and biodiversity degradation due to indiscriminate harvesting of crab from the nature, changes in salinity and temperature regime in coastal areas as caused by climate change issues, lack of industry-focused investment, lack of sufficient crab hatcheries and low production rate in present crab hatcheries, high production costs, and lack of vertical integration in the crab value chain.
Another challenge is the lack of a structured marketing system for mud crabs, with many intermediaries making it a complex system for crab farmers to navigate. Various actors such as wild collectors, farmers, traders, processors, and exporters are involved in the crab value chain. Farias play a crucial role in the local crab value chain, while small depots collect crabs from collectors, farmers, and farias and send them to larger depots. These larger depots act as

intermediaries between the local market and exporters in Dhaka. However, in this complex market systems the lower market actors especially crab collectors and crab farmers are exploited by the forward market actors.

Despite these challenges, collaboration among stakeholders and government support can create opportunities for expansion through policy measures that promote innovation, value-added processing, and provide financial and technical assistance to farmers.
The recommendations presented below are based on the lesson learnt of the activity implementation and challenges faced during the intervention period can make the sector sustainable.

- Crab farming in Bangladesh still depended on wild sources as the number of crab hatchery is very few and the production rate is not satisfactory yet. So, for the sustainability of the sub-sector more crab hatchery need to establish to supply the seed crab.
- Research and development efforts should have to continue to the present crab hatchery to optimize the hatchery protocol to scale up the production rate.
- Development of formulated feeds for mud crabs is likely to become increasingly important as, besides biodiversity concern, tilapia and other wild resources come under increasing pressure for use as food for human consumption. Use of such fresh feeds requires proper management to avoid deterioration of water quality. In addition, the problem of availability of fresh feeds restricts their usefulness as a regular diet. In the backdrop of current and potential future demand for crab feeds finding other sources of nutritious food items including development of a completely formulated diet using locally available ingredients are indispensable.
- Crab fatteners and grow-out farmers are decreasing alarmingly in south-west coastal region of Bangladesh due to market instability and lack of adequate seed crab. So, crab export policy should be standardized with intervene of Govt. agencies to make the system more operational.
- As still the crab sector in Bangladesh depends mostly on wild stock and the ban period of crab catching from nature is increasing so in the lean period the crab farmers and other stake holders should have to engage in alternative livelihood options.
- Coordination with Forest Department and Fisheries Department is essential to reduce harassment of crab collectors, crab farmers, farias and depot owners. Especially in ban period the harassment become more dreadful for crab farmers and depot owners.
- In case of soft shell crab farming, the farmers are exploited by the few local buyers due to absence of competitive market. So, establishment of competitive market system will make more advancement of the sector.
- Bangladeshi crab sector is dependent on international market so if incase the crab export will halt for even one month then the people involved in this sector will have incur a huge loss. Therefore, different initiatives have to take to create domestic crab market.

2.0 **Introduction**

2.1 Background of the Project

Coastal Bangladesh has the most commercially important species of mud crabs Scylla spp., from the family Portunidae. The 734-km long coastline of Bangladesh, with the world's largest mangrove forest, is a hotspot for diverse aquatic organisms, including mud crabs, providing suitable breeding, feeding and nursery grounds. Presently mud crab farming has emerged as an alternative livelihood, a source of income and nutrition and an innovative way of helping vulnerable littoral communities adapt to a changing climate. Mud crabs have already gained popularity among coastal communities in greater Khulna and Chittagong regions and are being recognized as a candidate species for culture in brackish water environments. There are about 300,000 people directly or indirectly connected with mud crab farming activities. In 2018-2019, Bangladesh earned US$ 42.93 million by exporting hard-shell live crabs to international markets, as compared to US$ 6.7 million in 2010-2011. Over the last ten years, production from mud crab fisheries has increased gradually, mainly related to more coastal people becoming interested in crab farming.

As the industry develops and the production area expands the demand for seed stock increases. In Bangladesh all the seed stock needed for mud crab farming is collected from the wild, with the estuaries and mangroves of the Sundarbans being the main source of seed stock for the coastal areas in the southwest. In addition, at present years crab farming transformed into a new mode of soft-shell crab farming as the global demand increasing day by day and earning of handsome foreign currency. The coastal district Satkhira have around 400 soft shell farms that requires at least 60,000,00 seed crabs per cycle. To run these farms smoothly a huge numbers of seed crabs need to harvest from wild putting under pressure the integrity of the Sundarbans' eco-system and biodiversity.

A crash in the wild population, from overharvesting, would also lead to a situation where the existing industry can no longer be sustained, which in turn would threaten the livelihood of a large number of people. Concerning this issue, Nowabenki Gonomukhi Foundation (NGF) established crab hatchery under PACE project of PKSF and producing crablet in a view to reduce pressure on wild stock. But the production rate of crablet in hatchery is still too low to meet 5% of the current demand of seed crab. The constraints behind the low survival rate in hatchery is due to inadequate technical knowledge and unavailability of inputs supply for crab hatchery. The unavailability of inputs supply is caused by the little demand as the number of crab hatchery is very limited only NGF-crab hatchery in Shyamnagar and other two entrepreneur level small crab hatchery in Cox's bazar are producing crablet successfully. The big investor is not coming forward to establish crab hatchery as the survival rate of crab hatchery is not reached at that standard to get profit by this business. There lies some gap also in farming stages of hatchery produced crablet because the crablet nursing technology is not well introduced to the crab farmers and again it takes at two and half month to become selling size. Moreover, the discrimination in getting fare price during in depot is also another cause of limited expansion of crablet nursing farm. High mortality during transport of crablet from hatchery to distant farms is hindering the expansion of nursing farm. The grow out crab farming is reducing day by day due to shortage of crabs for their farm as the soft shell crab farm collecting at least 60% of the total harvest of crab and around 35% of the total harvest is exported to foreign countries. Though the soft shell crab farms are purchasing about

60% of the total harvested crab yet still the farms are not running smoothly due to shortage of adequate seed crabs. Moreover, Government increased ban period of about six month (which was two month earlier) of catching crab and fishes from Sundarbans and its vicinity rivers as a result about half of the year the farms are not running smoothly due to unavailability of seed crabs. So, to keep running these farms round the year establishment of more crab hatcheries and the improvement in survivability rate of the hatcheries is inevitable.

2.2 Proposed Solution

The demand seed crabs is around 60,000,00 per month for soft shell crab farmers only other than grow out farming demand in Shyamnagar Upazila of Satkhira district and for which the crab farmers are solely dependent on wild harvest. But the wild stock is reducing day by day and the crab farmers cannot operate their farms in a sustainable manner due to shortage of seed crab. On the other hand Government imposed ban to go to Sundarbans and its vicinity rivers for about six months to catch fish and crabs that imposed another threat to this sub sector to continue farming round the year. Therefore, hatchery produced crablet nursing would be a good option to sustain this sector.

The project activities will not only increase crablet production through crab hatchery operation but also helps to farming sustainably in this sector. At the very beginning of the project a project orientation meeting for the project staff will be organized at the meeting room of Nowabenki Gonomukhi Foundation (NGF) with 15 participants (Project Staff-6, WF-4, NGF-5). To get a clear picture of crab value chain a Value Chain Assessment (VCA) research will be conducted in present crab culture prospective areas namely Satkhira, Khulna, Bagherhat, Cox'sbazar and Vola district first to know the existing scenario on market demand, problems and constraints of the sector, identify risks and challenges, sources of seed crab collection, cultural practices of all farming methods, profitability of all market actors, constraints and opportunities of export market. To conduct the crab value chain assessment 10 Focus Group Discussion (FGD) and 15 Key Informant Interview (KII) will be executed from the crab culturing location of the mentioned five district. A GIS map will be developed to know the locations of the market actors and MEL division of WorldFish, Bangladesh will support actively to develop the GIS map. Two capacity Building Event for Hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement will be organized to sensitize the hatchery technicians and government representative personnel. One of this event will be organized in Shyamanagar, Satkhira with 18 participants (9 technicians from 3 crab hatcheries, Project coordinator-1, Field Officer-2, Monitoring Officer-1, WorldFish representatives-3, DoF representatives-2) and the other one will be organized in Cox's bazar with 17 participants (9 technicians from 3 crab hatcheries, Project coordinator-1, Field Officer-1, WorldFish representatives-3, DoF and BFRI representatives-3). Capacity Building training for Hatchery technician on crablet production at hatchery, nursery management & grow-out technology improvement will be provided for the crab hatchery technicians to improve Zoea rearing skill to increase crablet production rate as well as improve their knowledge on crablet nursery management and grow-out culture of juvenile crab. To conduct the capacity building training for hatchery technicians a consultant from Vietnam, Philippines or other countries will be hired and the consultant will stay for 40 days in Bangladesh and provide hands on training to the technicians. Hands on training will be conducted in NGF Crab hatchery, Kalbari, Shyamnagar, Satkhira. From the project participant crab farmers 30

potential lead farmers will be selected of which 25 farmers will be selected from Shyamnagar and Koyra Upazila and 5 farmers will be selected from Cox's bazar and they will be provided capacity development training on good aquaculture practices (GAP), improved nursery and grow out management. Two capacity development training on good aquaculture practices will be organized to improve their knowledge on nursery and grow out management. One training will be organized in Shyamnagar Upazila in Satkhira district with 25 selected farmers from Shyamnagar and Koyra Upazila (Training participants; farmers-25, PC-1, FO-2, MO-1, WF-2) and the other training will be organized in Cox's bazar with 5 selected farmers (Training participants; farmers-5, PC-1, FO-1, WF-2). The trained 30 lead farmers will set up demonstration farm on crablet nursing to improve current cultural practices to get better result what will help to introduce crablet nursing techniques to the common crab farmers. 25 demonstration farm will be set up in Satkhira and Khulna district and 5 demonstration farm will be set up in Cox's bazar district to encourage more crab farmers to nurse crablet. Demonstration on advance crab farming will also set up with the same lead farmers and in this regard farmers who will have soft shell crab farm they use this juvenile to their farm and justify the survivability and production rate. On the other hand farmers will not have soft shell crab farm, they will grow out juvenile crab for 60 days and then will sell to the depot. Demonstration on advanced crab farming technology will also introduce (a) saline tolerant vegetable and other crops to grow on dyke of the selected nursery, grow out and soft shell farm, (b) poly-culture of crab with saline tolerant fish species, and (c) waste management at farm site. This activity will fulfill the nutritional demand of the farmers along with their farm income. This also encourage other farmers to control environmental pollution by proper farm waste management. 10 trial will be carried out to compare the wild crab and hatchery produced crab performance considering survivability and growth performance. All the trial will be conducted in Satkhira district and in this activity farmers will prepare a 10 decimal pond with two section each with 5 decimal land. One side of the nursing pond farmers will nurse hatchery produced crablet first to reach its weight at 20 gm and then wild juvenile crab of 20 gm will be collected from the depot and released to another side of the pond and they will exercise same feeding schedule and management practices for the both side and after 60 days they will harvest the adult crab and record the survivability and production to compare the performances. Linkage workshop with local input retailers and private sector input suppliers will promote availability of input supply like feed (artemia, feed, etc.) and aqua-chemicals (medicine, reagent, etc.). The linkage workshop will be organized in Barsha resort, Kalbari, Shyamnagar, Satkhira with 35 participants (Buyer- 5, Depo-5, Farmer-12, Sector Expert-2, DoF-2, Project Staff-5, NGF-2, WF-2). 48 courtyard meeting with crab farmers, input sellers and others will be organized to disseminate modern technology to the farmers along with a proper linkage would be made with crab farmers input suppliers and various service providers (like lab & consultation service etc.). Among the 48 courtyard meetings 38 meetings will be organized in Satkhira and Khulna district and 10 meetings will be organized in Cox's bazar district. Each courtyard meeting will contain 25 farmers, 1 input seller or service provider or crab buyer. This activity will help to disseminate messages about the availability and quality of nursing juvenile crab to grow out farmers, soft shell crab farmers and depot owners. However, it will also help to get fare price of the nursery owners. To promote the project activities 500 pieces of poster and 2000 pieces of leaflet/booklet will be prepared focusing (a) crablet nursing and juvenile grow out technique and (b) Good Aquaculture Practice (GAP) (c) environmental safety and waste management what will help to build up awareness of the

community people. Two regional knowledge sharing workshop on advance mud crab management technology dissemination with different value chain actors will be organized after completion of all the activities to explore business. One workshop will be organized in Barsha resort, Kalbari, Shyamnagar, Satkhira with 35 participants (Depot representatives-5, Farmer-12, Aqua inputs seller-5, Sector Expert-2, DoF-2, Project Staff-5, NGF-2, WF-2) and the other one will be organized in Cox's Bazar with 20 participants (Depot representatives-2+Farmer-5, Aqua inputs-3, Sector Expert-1, DoF & BFRI-2, Project Staff-2, NGF-1, WF-4). At the end of activities implementation a project closing meeting will be organized in Sathkira 40 participants (Buyer- 5, Depo-5, Farmer-12, Sector Expert-2, DoF-2, Project Staff-5, NGF-2, WF-3, Others-4) where the successes of the project activities will be highlighted to the participants.

2.3 Objectives of the Partnership

- To assess the existing market of mud crab in Bangladesh
- To assess the operation of mud crab hatcheries in the south-west area of BD
- To provide recommendations of actions to support the growth of mud crab hatcheries, nurseries and grow-out systems
- To provide recommendations for other actions to support the value chain of mud crab
- To identify the demand to increase the mud crab production in Bangladesh

2.4 Geographic Coverage

Shyamnagar Upazila in Satkhira district is renowned for crab trading (Crab collector, crab fatteners, Soft shell crab farmers and depots all are present here), Koyra Upazila in Khulna district and Maheshkhali, Chakaria and Teknaf Upazila in Cox’s bazar district are also well known for crab farming and trading therefore the project activity will be implemented in Shyamnagar Upazila of Satkhira district, Koyra Upazila in Khulna district and Maheshkhali, Chakaria and Teknaf Upazila in Cox’s bazar district. Geographically Shyamnagar is located at 22.3306°N 89.1028°E and is bordered by Kaliganj (Satkhira) and Assasuni upazilas to the north, the Sundarbans and Bay of Bengal to the south, Koyra and Assasuni upazilas to the east and the Indian state of West Bengal to the west. Koyra Upazila (Khulna District) is located in between 22°12' and 22°31' north latitudes and in between 89°15' and 89°26' east longitudes. Due to the presence of mangrove forest Sundarbans which is the habitat of mud crab, the collection of crab from Sundarbans and the estuaries and crab farming and trading is a livelihood options in this region. Chakaria Upazila (in between 21°34' and 21°55' north latitudes and in between 91°54' and 92°54' east longitudes), and Teknaf Upazila (in between 20°23' and 21°09' north latitudes and in between 92°05' and 92°23' east longitudes) in Cox’s bazar district are located in vicinity of Bay of Bengal and therefore the fishermen used to go to catch crab from the Bay of Bengal and do crab fattening and trading. Therefore these two Upazilas of Cox’s bazar district will also be considered as the project area. Nowabenki Gonomukhi Foundation (NGF) has a long experience of working with crab sector in Shyamnagar and Koyra Upazilas since 2011. NGF has no experience of working in Cox’s bazar district but the long experience of working in crab sector will help us to implement the project activities in those Upazilas of Cox’s bazar district. NGF established the first crab hatchery in Bangladesh in 2016 at Kolbari in Shyamnagar Upazila and this crab hatchery will supply crablet to continue the activities of this project.

2.5 Project KPI and Budget Summary

Key Performance Indicator (KPI) of the project

Activity	Means	Unit	Targets	When	MOV
Capacity Building Event for Hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement	# of training	Number	2		Attendance sheet
	# of participants	Number	18	Mar'23	
Capacity development training for crab farmers & Nursery owners on good aquaculture practices (GAP), improved nursery & grow out management	# of training	Number	2	Apr'23	Attendance sheet
	# of participants	Number	30		
Demonstration on crab let nursing technology to improve current practices for better production	# of Demo	Number	30	May'23	Report
Demonstration on advanced crab farming technology	# of Demo	Number	30	July'23	Report
Organize Courtyard meeting with crab farmers, input sellers and others for technology dissemination	# of meeting	Number	48	Feb-May'23	Attendance sheet
	# of participants	Number	1200		
Organize regional knowledge sharing workshop on advance mad crab management technology dissemination with different value chain actors to explore business	# of workshop	Number	2	Aug-Sep'23	Attendance sheet
Linkage building workshop with crab buyers, exporters and private sector input suppliers	# of workshop	Number	1	Apr'23	Attendance sheet

2.6 Budget Summary of the project

Summary Budget	% of WorldFish	% of Grantee	Total	FtF BAA	Grantee
Total Activity Cost (BDT)	**100%**	**0%**	**5,651,824**	**5,651,824**	**0**
Equivalent USD (Ex Rate-102.87)	**100%**	**0%**	54,941	54,941	0

3 Project Performance

3.1 Outreach Summary

Outreach summary of the project is given below-

Outreach category	Total target	Achievement	Percentage
Farmer	1200	1336	111.33%
Input seller	50	5	10%
Depot owner	20	11	55%

3.2 Key Performance Indicators

Activity	Means	Unit	Targets	Achievement	Percentage
Capacity Building Event for Hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement	# of training	Number	2	2	100%
	# of participants	Number	18	14	77.78%
Training to the hatchery technicians on crab let production at hatchery, nursery management & grow-out technology improvement	# of training	Number	1	1	100%
Capacity development training for crab farmers & Nursery owners on good aquaculture practices (GAP), improved nursery & grow out management	# of training	Number	2	2	100%
	# of participants	Number	30	30	100%
Demonstration on crab let nursing technology to improve current practices for better production	# of Demo	Number	30	25	83.33%
Demonstration on advanced crab farming technology	# of Demo	Number	30	30	100%
Carried out a trial to compare the wild crab and hatchery produced crab performance considering survivability and growth performance	# of Demo	Number	10	10	100%
Organize Courtyard meeting with crab farmers, input sellers and others for technology dissemination	# of meeting	Number	48	48	100%
	# of participants	Number	1200	1286	107.17%

Activity	Means	Unit	Targets	Achievement	Percentage
Organize regional knowledge sharing workshop on advance mad crab management technology dissemination with different value chain actors to explore business	# of workshop	Number	2	1	50%
Linkage building workshop with crab buyers, exporters and private sector input suppliers	# of workshop	Number	1	1	100%

3.3 Activity Performance

Name of the activity: Capacity Building Event for Hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement.

The purpose of this activity is to develop theoretical skill of the hatchery technicians and encourage them to participate in practical training of crablet production through hatchery operation to improve survival rate of crablet production. Before conducting the capacity development event, technicians of present crab hatchery, entrepreneurs and enthusiastic investors were communicated to participate in the event as trainee. Under this activity two events were organized in Satkhira (07 June, 2023) and Cox's Bazar (15 June, 2023) Districts where total 14 participants were present. The participants were the hatchery technicians, entrepreneur level hatchery owner, managerial staff of different hatcheries and some enthusiastic participants who are willing to set up crab hatchery. In this training the participants were sensitized about the crab hatchery operation procedure, nursery management and improved technology to practice in case of grow out culture practices. International consultant and the project coordinator were facilitated the training session. The participants asked their different questions about economical sustainability of crab hatchery, benefits of nursery and grow-out culture practices etc. However, the facilitators were cordially answered their questions in details to motivate them establish crab hatchery. However, after completion of these two events the participants were pledged to participate in practical training of crab hatchery operation and some of them explore their willingness of crab hatchery establishment.

Name of the activity: Training to the hatchery technicians on crab let production at hatchery, nursery management & grow-out technology improvement

The objectives of this activity is to identify the problems and prospects of current operation procedure of crab hatchery, potential reduction of mortality during the metamorphism of Zoea-V to Megalopa stage and to increase crablet production around 5% survival rate. In addition, the development of training Materials on Crablet Production at Hatcheries, and crab Nursery management and grow-out culture technique.

Regarding the objectives an international consultant was hired from Philippine and he conducted the practical training session in NGF-Crab Hatchery from 17 May, 2023 to 15 July, 2023. In this training, technicians of NGF-crab hatchery, technicians of Japan Fast Trade Ltd. hatchery, interested soft shell farms and entrepreneur level hatchery operators joined as training participants. The consultant trained them practically on sea water management, checking and maintenance of water quality, broodstock management, total zoea counting after successful hatching, zoea counting for stocking in larva tank, zoea rearing in different stages, feeding management of zoea and monitoring of pathogenic infestation and control techniques, harvesting of crablet and counting etc. During the training period the trainee received a holistic knowledge on crab hatchery operation technique and received material on crab nursery management and grow-out culture techniques. However, the main purposes of the training meant to increase crablet production survivability rate at around 5% was not achieved as the consultant had previous experience of crablet production with *Scylla serrata* species but in Bangladesh we have more than 90% mud crab species of *Scylla olivacea* specie which is characterized as more aggressive and more cannibalistic than other three species of mud crab.

Name of the Activity: Capacity development training for crab farmers & Nursery owners on good aquaculture practices (GAP), improved nursery & grow out management

Traditionally the crab farmers of south-west coastal region of Bangladesh are used to collect their seed crab from wild or are purchased from local depots (after sorting and grading) for stocking. Hence, the crab farmers got low quality seed crab from depots as they sell those after their sorting for upper market and that aggravated the farm mortality. Moreover, the technical knowledge of the crab farmers are also

limited. Therfore, the purpose of this activity was to habituated the crab farmers to crablet nursing and to develop their capacity on good aquaculture practices and improved crablet nursery and grow-out crab culture management. This training was provided to the 30 interested crab farmers selected from Satkhira, Khulna and Cox's Bazar districts.

The training participants were selected on basis of their interest, having culture pond, previous experience of crab farming and education. Training was provided by two separate events as the farmers of Satkhira and Khulna districts were included in first event and the farmers of Cox's Bazar districts were included in second event. The first event was organized in Tiger Point, Shushilan, Shyamnagar, Satkhira on 18 April, 2023 and the second event was organized in training venue, DoF, Cox's Bazar on 27 April, 2023. In the training they have got informed about the prestocking and post stock management of crablet nursing and grow-out culture of crab, water quality maintenance technique, feeding schedule and feed amount calculation, diseases infestation monitoring and control, harvesting technique and post harvest management etc. After, getting training they had set up crablet nursing pond following the guideline and stocked crablet purchased from NGF-crab hatchery. They had got an average of 80% survivability at happa net stage and around 65% survivability at semi-adult crab stages which was surprising and they benefitted economically.

Name of the activity: Demonstration on crab let nursing technology to improve current practices for better production

This activity was implemented in April, 2023 to disseminate the improved crablet nursing technology to the general crab farmers for better survivability and production this activity was implemented in the working area. Under this activity 25 demonstration pond had been set up mainly in Shyamnagar and Koyra Upazila as these regions are renowned for crab farming. Before setting up demonstration pond the farmers were selected on the basis of their previous experience of crab farming, technical knowledge, pond size and most importantly their interest of crablet nursing. Eight crab farmers from Koyra Upazila and 17 crab farmers from Shyamnagar Upazila were selected and they were provided training on "good aquaculture practices (GAP), improved nursery & grow out management" afterward. In the training they have got informed about the prestocking and post stock management of crablet nursing and grow-out culture of crab, water quality maintenance technique, feeding schedule and feed amount calculation, diseases infestation monitoring and control, harvesting technique and post harvest management etc. Each farms were prepared according to training knowledge and instruction of the field officers. The farm size was at least 5 decimal and were fenced with bamboo slate and nylon net to ensure biosecurity. Then the demonstration farms were stocked with 2000 pieces of crablets supplied through NGF-crab

hatchery. At the very first the crablets were stocked into happa nets and after three days the survived crablets were counted and were released into the nursing pond. The crablets were fed twice a day according to the instruction provided in booklet “Sustainable Crab Nursery Management Technique”. On top of that in every week the quality of the nursing pond were monitored and even the health of the crablets too.

After three months when the crablets became semi-adult then those were harvested and the number of semi-adult and weight of the same were recorded. The farmers of demonstration pond got an overwhelming result as an average of 80% survival rate at happa net stage and 65% survival rate at harvest. The farmers harvested an average of 65 kg semi-adult crab and sold at a rate of BDT.380/ Kg which equals to BDT. 24,700. The total cost of their nursing pond was 7500 which was supported by the project. So, they profited an average of BDT.17200 by nursing of 2000 pieces of crablets.

Name of the activity: Demonstration on advanced crab farming technology

Demonstration on advance crab farming was set up in a view to ensure grow -out culture of the juvenile crab produced from crablet nursing demonstration. Another important purpose of the activity was to introduce (a) saline tolerant vegetable and other crops to grow on dyke of the selected grow out farms, (b) poly-culture of crab with saline tolerant fish species, and (c) waste management at farm site. This activity will fulfill the nutritional demand of the farmers along with their farm income. This activity was implemented in June, 2023 with the selected crablet nursing demo farmers. When the crablets reached at juvenile crab (at least 50g) in nursing pond then the farmers were sensitized to move forward for advanced crab farming. Therefore, under this activity 25 demonstration was implemented in Shyamnagar and Koyra Upazila in Satkhira and Khulna district respectively and another 5 demonstration pond was set up in Cox’s Bazar separately with stocking density of 400 Juvenile crab in each pond. At average weight of 180 gm the demonstration pond were harvested and observed 65% survivability in average. So, from each demonstration pond average 216 kg of adult carb were harvested which was sold at average price of BDT. 650/kg means the total selling price of BDT.140,400 from each pond. The average cost of each demonstration pond was about BDT. 40,000. So, by deducting the operation cost from the selling price each farmers got benefitted of average BDT. 100,400.

Name of the activity: Carried out a trial to compare the wild crab and hatchery produced crab performance considering survivability and growth performance

The trial activity was carried out in June, 2023 in a view to compare the survivability and growth performance of wild crab and hatchery produced crab June 30, 2023. Under this activity 10 trial study was conducted at Shyamnagar upazila in Satkhira district. Before setting up the study plot 10 potential and experienced crab farmers were selected from the project beneficiaries of Shyamnagar upazila having at least 10 decimal pond size. The selected farmers were sensitized first about the importance of the study so that they do follow strictly the guideline of pre-stocking and post-stocking management. For pre-stocking management, firstly they discharged their pond water and removed the bottom marsh and kept fallow for drying out of the pond. In the meantime bank of the pond was repaired and separated into two parts by bamboo slate fence. Then lime was applied to the pond according to the guideline and washout the pond afterward. Fertilizers were applied then and water entered to the pond. After entering water to the pond disinfectant were applied to make the water free from pathogen. Then the trial ponds were stocked with 200 pieces of juvenile crab in each parts of the trial ponds. The hatchery produced juvenile crabs (53 gm) were purchased from the crablet nursery and the same size wild juvenile crabs were purchased from the local depots. Before stocking the juvenile crabs were disinfected and acclimatized with pond water to reduce shock. The stocked Juveniles were fed with minced fresh tilapia fish twice daily. Water quality and health condition of the cultured crabs were observed weekly basis. To observe the growth performance data on CL, CW, and BW of 5 sample crabs from each section of trial pond were recorded. The result showed that growth rate of hatchery originated juveniles were about 15% higher than the wild juvenile. Moreover, the survival rate of the hatchery originated juveniles were about 20% higher than the wild juvenile.

Name of the activity: Organize Courtyard meeting with crab farmers, input sellers and others for technology dissemination

The activity was implemented to disseminate the improved crablet nursing technology to the general crab farmers for better survivability and production. The activity was implemented during the period of February, 2023 to May, 2023 in Shyamnagar upazila of Satkhira district, Koyra upazila of Khulna district and Teknaf and Chakaria upazila of Cox's Bazar district. In total 48 courtyard session was conducted in three district to reach out the target beneficiaries. Before conducting these session, Field officers of the project formed 48 crab farmers group in the mentioned four upazilas of which 24 groups were formed in Shyamnagar, 14 groups were formed

in Koyra and 10 groups were formed in Teknaf and Chakaria upazila and each groups were composed of 25 crab farmers.

Through this activity 1316 crab farmers were reached of which 620 farmers were male 696 farmers were female. In these sessions, the Field Officers discussed about the crablet nursery pond management techniques, good aquaculture practices, grow-out culture technology of crab etc. Input sellers and other stakeholders of crab value chain were also presented in these event for better communication with the crab farmers so they can avail their necessary goods in time for crab farming. Sometimes, the representatives of aqua-medicine companies were also presented to these events and discussed about the effectiveness of their products for growth and diseases prevention.

Name of the activity: Organize regional knowledge sharing workshop on advance mad crab management technology dissemination with different value chain actors to explore business

The purpose of this activity was to share the knowledge, experience and good practices of mud crab farming to the crab stakeholders and the activity performed on 22 August, 2023 at Conference room-NGF-Head Office, Nowabenki, Shyamnagar, Satkhira. In this event the benefits of advance mud crab farming technology to the value chain actors, challenges in the crab value chain, good practices of mud crab farming were disseminated to the crab stakeholders and was also informed the growth potentials of hatchery produced seed crabs to the crab farmers. District Fisheries Officer, Md. Anisur Rahman was present as Chief Guest of the event and SUFO- Shyamnagar, Mr. Tushar Kanti Mazumdar was also present in the event as special guest. At welcome speech, Tushar Kanti Mazumdar noted that crab is growing sector because of its rising demand in international market. So, this project activities contributing to the advance crab farming technology dissemination will have significant impact on increasing farm production. The chief guest, inaugurated the event and in his welcome speech he told that crab sector is contributing significantly in foreign revenue income and also become an alternative livelihood option for poor coastal community. But due to lack of technical knowledge we cannot produce

optimum amount of crab in farm production. Therefore, this project intervention will help to improve our farmers' production rate, I hope. Then Md. Masudul Haque, Project Coordinator presented a power point presentation to share the knowledge and experiences gained though the project implementation. Some farmers also share their learning and experiences in the event.

Name of the activity: Linkage building workshop with crab buyers, exporters and private sector input suppliers

Linkage building workshop with crab buyer, local input retailers and private sector input suppliers was organized to promote availability of input supply like feed (artemia, feed, etc.) and aqua-chemicals (medicine, reagent, etc.) for sustainable crab farming in south-west region of Bangladesh. The event was organized in 08 March, 2023 in Shyamnagar with the participation of crab stakeholders and discussed how to promote the availability of input supply like feed (artemia, feed, etc.) and aqua-chemicals (medicine, reagent, etc.). In addition the current problems of the market system was also discussed in the meeting and some possible solution was also came forth in the workshop. District Fisheries Office-Satkhira, Md. Anisur Rahman and SUFO was present in the workshop and in their welcome speech they told that crab is a growing sector and has huge demand in international market but to make this sector sustainable we have to practice crab culture with hatchery produced crablet. In the open discussion section, they attendees actively participated and arose different questions and the DFO-Satkhira replied the possible solutions. The notable points the DFO mentions are-

a) The crab farmers have to registered as crab farmers and SUFO will take necessary steps in this regards
b) Crab collectors needs to renew their registration to get subsidy from GOVT in Ban period
c) The depot owners should have to keep document from crab farmers at time time of purchase and attach to their challan when send these to forward market so they can get rid of harassment from police or foresters.
d) The depot owners should have to submit application to UNO as they are harassed by the local police. And the copy of the application will have to submit to SUFO and DFO so they can discuss with higher authorities regarding the problem.

3.4 **Lessons Learnt**

Key Lessons Learnt of the interventions are-

- The total area suitable for crab cultivation in Bangladesh is 228,000 ha therefore, the country needs about 2.8 billion juvenile crabs for farming. This corresponds to 22 billion crablets from hatchery considering 8 cycles per year
- It seems highly impractical to produce such huge number of crablets but the shrimp industry also went through the same transition and currently shrimp hatchery produces over 7 billion post larvae 44 shrimp hatcheries. A possible solution is to develop and transfer the hatchery technology to small scale entrepreneurs who can set up hatcheries at the household level.
- The crab species found in Bangladesh territory is *Scylla olivacea* previously called *S. serrate and the c*annibalism rate of *Scylla olivacea* is greater than other mud crab species
- Dadon system exploiting the crab collectors.
- Middleman in crab sub-sector exploiting the lower levels market actors.
- After Covid-19 crab fatteners and grow-out farmers are migrating to soft shell crab farming because of market instability.
- Crablet nursing is a profitable option for crab farmers but due to inadequate supply farmers could not continue crablet nursing round the year
- Proper technical knowledge gap increasing farm mortality and post-harvest mortality which in turn reducing profit
- Average survivability rate is crablet nursing to produce juvenile crab is around 65% which profitable for farmers
- Growth rate of hatchery produced juvenile crab is faster than wild juvenile crab
- Crab farming requires small pond, low investment and low labor cost
- Lack of quality seed crab reducing the profitability of crab farmers
- Depots provide low price in case of juvenile from hatchery seed
- Huge demand of seed crab but not available
- If feeding schedule and frequency is maintained properly then growth of farming crab get faster.
- International soft shell crab market is expanding
- Around 40% of plastic cages are being unused due to shortage of seed crab
- No established local market and farmers are being exploited
- Soft shell crab farming requires sufficient capital investment and therefore the farming is going under control of rich farmers
- High mortality rate reducing profit

3.5 Challenges

Key Actors	Challenges
Wild collectors	- Sundarbans BLC and permit issues are not transparent - Risks to assets and lives due to wild lives and piracy - Lack of customized weather forecasting and shelter during extreme weather conditions - High maintenance costs for crafts and gears - Lack of bargain power over price due to conditional loan - Lack of social safety net during ban period/ lean season
Farmers	- Lack of mud crab hatcheries and dependence on wild stocks for seed supply - High costs for fencing, net, cage etc. - Unwillingness of pre-stock and post-stock management - Lack of cost-effective alternative to live feed - Still some crab farmers have confusion of growth and survivability of crablet nursing - Lack proper technical knowledges - Crop failure due to disease and water quality fluctuations - Lack of bargain power over price due to conditional loan - Lack of social safety net during ban period/lean season
Farias	- Limited access to credit - Poor market intelligence - Lack of knowledge on live crab handling
Depots	- Limited access to credit - Inadequate and substandard storage facilities - Lack of knowledge on live transportation - High transportation costs
Exporters	- High freight charge - Lack of market intelligence - Evolving compliance issues from the importing countries - Limited access to credit

3.6 Key Innovation of the Project

- ❖ Crablet nursing technology dissemination
- ❖ Advanced crab farming technology dissemination
- ❖ Growth and survivability comparison trial between wild juvenile and juvenile produced from crablet nursing
- ❖ Booklet development on “Sustainable Cablet Nursery Management Technique”

3.7 Impact and Sustainability of the Intervention/ Business Model

3.7.1 Impacts of the intervention

Sl no.	Activity Name	Impacts of the activity
01	Mud Crab Value Chain Assessment	▪ Present market scenario of crab sector in Bangladesh have been identified ▪ Role of different market actors have been demonstrated ▪ Present challenges of crab sector have been defined ▪ Future actions have also been recommended for the sub-sector to run sustainably
02	Capacity development training for crab farmers & Nursery owners on good aquaculture practices	▪ Developed technical knowledge of crab farmers ▪ Farmers have learned about crablet nursing technology ▪ Farm mortality have reduced and farmers are benefitted more than before
03.	Courtyard Meeting with Crab Farmers, Input Sellers & Others	▪ Crablet nursing technology dissemination ▪ Updated the crab farmers about pre-stock & post-stock management of crab farming ▪ Coordination have made with crab farmers & input sellers
	Capacity Building Event for Hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement	▪ Theoretical capacity of the hatchery technicians have been developed ▪ Training participants motivated to attend practical training of hatchery technology ▪ Some investor/entrepreneur expose their willingness of establish crab hatchery ▪ Training participants have updated about the different unknown aspects of crab hatchery
	Hands on Training to the Hatchery Technicians	▪ Training participants received practical training on broodstock management ▪ Water quality maintenance procedure ▪ Counting of total zoea and appropriation of zoea stocking in LRT ▪ Zoea rearing technique ▪ Diseases infestation and control mechanism
	Crablet Nursing Demonstration	▪ Farmers confusion about growth and survivability of crablet nursing have recovered ▪ General farmers get opportunity to know the crablet nursing system

		▪ Now farmers are believing that hatchery crablet nursing can reduce pressure on wild stock ▪ General crab farmers receiving the technology positively ▪ Farmers got economic benefit than crab fattening
	Advance Crab Farming Demonstration	▪ With proper management farmers getting profit with short time ▪ With faster growth and high survivability farmers earning more than wild juvenile culture ▪ Poly culture with fish meeting family nutritional demand ▪ Vegetable cultivation in dike getting opportunity of secondary income along with mitigating family demand of vegetables
	Trial to compare growth & survivability between wild juvenile and juvenile from hatchery produced crablets	▪ Survivability rate of the hatchery produced juvenile have been identified ▪ Indicated faster growth performance of hatchery juvenile than wild juvenile ▪ Low mortality rate of hatchery juvenile have been noticed ▪ Farmers would need shorter time to become selling size in case of Juvenile produced from hatchery crablets
	Linkage building workshop with crab buyers, exporters and private sector input suppliers	Few important decisions had been undertaken in the event with the presence of DFO, Satkhira and those were- ▪ crab farmers will have to register with ID no. and SUFO will take necessary steps in this regards ▪ Crab collectors will have to renew their registration to get subsidy from GOVT in Ban period ▪ The depot owners should have to keep document from crab farmers at time time of purchase and attach to their challan when send these to forward market so they can get rid of harassment from police or foresters. ▪ The depot owners should have to submit application to UNO as they are harassed by the local police. And the copy of the application will have to submit to SUFO

		and DFO so they can discuss with higher authorities regarding the problem.
	Organize regional knowledge sharing workshop	▪ Good practices of the project activities shared with the farmers and other stakeholders so they can adopt the practice for better production ▪ Lesson learnt of the project shared with the crab farmers and other stakeholders so the stakeholders can plan appropriately to run their business smoothly ▪ Market challenges had also discussed in the workshop so the market actors can make plan to cope with the challenges
	Booklet development on "Sustainable Crablet Nursing Management Technique"	▪ It will help the crab farmers as a crablet nursing manual ▪ Farmers will get information about the DO's and DON'T's of crab farming

3.7.2 Sustainability of the intervention

Under the present intervention technical knowledge of crab farmers have developed by providing capacity development training for crab farmers & Nursery owners on good aquaculture practices and conducting courtyard meeting with Crab Farmers, Input Sellers & Others. In addition, crablet nursing technology has been disseminated to the coastal crab farmers through crablet nursing demonstration set up and distributing booklet on "Sustainable Crab Nursery Management Technique" to the farmers. Consequently, the knowledge gap of the crab farmers has been resolved and now they practicing the nursery management following the guideline of the mentioned booklet therefore the growth and survivability of the crab farms increased. On top of that previously crab farmers have much confusion about the growth rate and survivability of hatchery produced crablet but those have been resolved by the result of the demonstration. Even, the crab mortality in different stages like, farming and transportation has been reduced so they are getting more profit than before. Moreover, in the recent past the crab farmers of the project working area were become reluctant to grow-out culture due to different inevitable reasons like lack of quality seed supply, high mortality rate, market instability and shortage of juvenile crab etc. However, through this intervention the grow-out crab farmers were received training on crab farming that increased their technical knowledge and the adoption of advance crab farming technique reduced the farm mortality and the knowledge of crablet nursing technology reduced their dependency on wild juvenile crab as seed crab. Sufficient survivability and growth potentiality of juvenile crab produced from hatchery crablet nursing have made their interest again in grow-out culture of juvenile crab as they are getting benefitted more with this new system. Again, the vegetable cultivation on the dike of the farming pond also created option for income along with meeting their family needs. Again, the comparison trial of wild juvenile and juvenile produced from hatchery crablet demonstrated higher growth and survivability of hatchery originated juvenile therefore, farmers perception have been changed and are interested to collect and nurse hatchery crablet which will ultimately reduce the pressure and dependency on wild stock. Under this intervention we also trained hatchery technicians practically by hiring international consultant to reduce the knowledge gap of crab hatchery operation what will help to increase the crablet

production rate in hatchery operation. Hence, the seed supply for the farmers will be ensured. Therefore, it is to said that as the farmers capacity have been developed and they are getting benefitted by utilizing this technical knowledge and their seed demand will be supplied by hatchery operation so, this project activities will be sustained after completion of the project. Even, considering the sustainability of the project activities, the fisheries officer of NGF will provide the technical support of crab farmers and the program officer (PO) of micro-finance program will monitor the activities of the farmers. In addition, NGF has different micro-credit scheme by which NGF will support the farmers especially loan scheme for the crab farmers will help to make the activities sustainable.

3.8 Recommendations / Future Directions

- Crab farming in Bangladesh still depended on wild sources as the number of crab hatchery is very few and the production rate is not satisfactory yet. So, for the sustainability of the sub-sector more crab hatchery need to establish to supply the seed crab.
- Research and development efforts should have to continue to the present crab hatchery to optimize the hatchery protocol to scale up the production rate.
- Development of formulated feeds for mud crabs is likely to become increasingly important as, besides biodiversity concern, tilapia and other wild resources come under increasing pressure for use as food for human consumption. Use of such fresh feeds requires proper management to avoid deterioration of water quality. In addition, the problem of availability of fresh feeds restricts their usefulness as a regular diet. In the backdrop of current and potential future demand for crab feeds finding other sources of nutritious food items including development of a completely formulated diet using locally available ingredients are indispensable.
- Crab fatteners and grow-out farmers are decreasing alarmingly in south-west coastal region of Bangladesh due to market instability and lack of adequate seed crab. So, crab export policy should be standardized with intervene of Govt. agencies to make the system more operational.
- As still the crab sector in Bangladesh depends mostly on wild stock and the ban period of crab catching from nature is increasing so in the lean period the crab farmers and other stake holders should have to engage in alternative livelihood options.
- Coordination with Forest Department and Fisheries Department is essential to reduce harassment of crab collectors, crab farmers, farias and depot owners. Especially in ban period the harassment become more dreadful for crab farmers and depot owners.
- In case of soft shell crab farming, the farmers are exploited by the few local buyers due to absence of competitive market. So, establishment of competitive market system will make more advancement of the sector.
- Bangladeshi crab sector is dependent on international market so if incase the crab export will halt for even one month then the people involved in this sector will have incur a huge loss. Therefore, different initiatives have to take to create domestic crab market.

4 Project Budget and Financial Management

		Milestone-1			Milestone-2			Milestone-3			Milestone-4			Total		
#	Activities	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants
5.01	**Project Orientation for project staffs**	1	9,150	-	-	-	-	-	-	-	-	-	-	**1**	**9,150**	**-**
5.02	**Preparatory work for farmers location, farmer introduction on activities sharing, and GPS Mapping**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.03	**Conducting Value Chain Assessment (VCA) of mud crab**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.03.01	Consultancy Fees	10	100,000	-	15	150,000	-	-	-	-	-	-	-	**25**	**250,000**	**-**
5.03.02	Consultant Travel & Accommodation	5	50,000	-	10	100,000	-	-	-	-	-	-	-	**15**	**150,000**	**-**
5.03.03	FGD	5	25,000	-	5	25,000	-	-	-	-	-	-	-	**10**	**50,000**	**-**
5.03.04	KII	5	10,000	-	10	20,000	-	-	-	-	-	-	-	**15**	**30,000**	**-**
5.04	**Developing GIS Mapping of mud crab value chain**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.05	**Capacity Building Event for Hatchery technician on crab let production at hatchery, nursery management & grow-out technology improvement**	2	38,000	-	-	-	-	-	-	-	-	-	-	**2**	**38,000**	**-**
5.06	**Training to the hatchery technicians on crab let production at hatchery, nursery management & grow-out technology improvement**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.06.01	Consultancy Fee	20	617,220	-	20	617,220	-	-	-	-	-	-	-	**40**	**1,234,440**	**-**
5.06.02	International Transportation	1	60,000	-	1	60,000	-	-	-	-	-	-	-	**2**	**120,000**	**-**
5.06.03	Accommodation	19	57,000	-	19	57,000	-	-	-	-	-	-	-	**38**	**114,000**	**-**
5.06.04	Perdiem	20	40,000	-	20	40,000	-	-	-	-	-	-	-	**40**	**80,000**	**-**
5.06.05	Workshop related expenses-(Domestic air fare & vehicle, accommodation, food and others), including the cost of the practical training for the consultant and participants	1	73,870	-	1	73,870	-	-	-	-	-	-	-	**2**	**147,740**	**-**
5.07	**Capacity development training for crab farmers & Nursery owners on good aquaculture practices (GAP), improved nursery & grow out management for 30 lead farmers**	-	-	-	2	45,100	-	-	-	-	-	-	-	**2**	**45,100**	**-**
5.08	**Demonstration on crab let nursing technology to improve current practices for better production**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.08.01	Crab Let	-	-	-	60,000	120,000	-	-	-	-	-	-	-	**60,000**	**120,000**	**-**
5.08.02	Net and Fence	-	-	-	30	75,000	-	-	-	-	-	-	-	**30**	**75,000**	**-**
5.08.03	Auqa inputs	-	-	-	30	9,000	-	-	-	-	-	-	-	**30**	**9,000**	**-**
5.08.04	Feed	-	-	-	30	21,000	-	-	-	-	-	-	-	**30**	**21,000**	**-**
5.09	**Demonstration on advanced crab farming technology**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.09.01	Auqa inputs	-	-	-	-	-	-	30	9,000	-	-	-	-	**30**	**9,000**	**-**
5.09.02	Feed	-	-	-	-	-	-	30	165,888	-	-	-	-	**30**	**165,888**	**-**

		Milestone-1			Milestone-2			Milestone-3			Milestone-4			Total		
#	Activities	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants	No of Units	FtF BAA	Grants
5.10	**Carried out a trial to compare the wild crab and hatchery produced crab performance considering survivability and growth performance**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.10.01	Juvenile Crab (Wild)	-	-	-	-	-	-	12,500	75,000	-	-	-	-	**12,500**	**75,000**	**-**
5.10.02	Crab let (Hatchery)	-	-	-	-	-	-	25,000	50,000	-	-	-	-	**25,000**	**50,000**	**-**
5.10.03	Net and Fence	-	-	-	-	-	-	10	60,000	-	-	-	-	**10**	**60,000**	**-**
5.10.04	Auqa inputs	-	-	-	-	-	-	10	5,000	-	-	-	-	**10**	**5,000**	**-**
5.10.05	Feed for Crab let to Juvenile (Hatchery)	-	-	-	-	-	-	10	7,000	-	-	-	-	**10**	**7,000**	**-**
5.10.06	Feed for Juvenile to adult crab (Wild and Hatchery)	-	-	-	-	-	-	10	100,000	-	-	-	-	**10**	**100,000**	**-**
5.11	**Organize Courtyard meeting with crab farmers, input sellers and others for technology dissemination**	18	119,500	-	30	195,000	-	-	-	-	-	-	-	**48**	**314,500**	**-**
5.12	**Organize regional knowledge sharing workshop on advance mad crab management technology dissemination with different value chain actors to explore business**	-	-	-	-	-	-	-	-	-	2	110,500	-	**2**	**110,500**	**-**
5.13	**Linkage building workshop with crab buyers, exporters and private sector input suppliers**	-	-	-	-	-	-	1	54,750	-	-	-	-	**1**	**54,750**	**-**
5.14	**Promotional activities**	-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
5.14.01	Leaflets/Booklet	2,000	20,000	-	-	-	-	-	-	-	-	-	-	**2,000**	**20,000**	**-**
5.14.02	Poster	500	15,000	-	-	-	-	-	-	-	-	-	-	**500**	**15,000**	**-**
5.15	**Project coordination meeting**	-	-	-	1	2,250	-	1	2,250	-	-	-	-	**2**	**4,500**	**-**
5.16	National Fish Week and Day Observe (International Women's Day and Youth Day)	1	8,000	-	-	-	-	1	8,000	-	1	8,000	-	**3**	**24,000**	**-**
5.17	**Attending training on environment and climate organized by WorldFish (as applicable)**	1	-	-	-	-	-	-	-	-	-	-	-	**1**	**-**	**-**
5.18	**Project closing meeting**	-	-	-	-	-	-	-	-	-	1	55,400	-	**1**	**55,400**	**-**
5.19	Monthly Progress Report	2	-	-	2	-	-	2	-	-	2	-	-	**8**	**-**	**-**
5.20	Project Completion report	-	-	-	-	-	-	-	-	-	1	-	-	**1**	**-**	**-**
5.21	MEL data collection, processing and submission (as applicable)	2	-	-	2	-	-	2	-	-	2	-	-	**8**	**-**	**-**
5.22	Success story collection and dissemination (as applicable)	2	-	-	2	-	-	2	-	-	2	-	-	**8**	**-**	**-**
MC	Management Cost (Personnel, Supplies, Travel)	2	441,716	-	2	429,716	-	2	505,716	-	2	710,708	-	**8**	**2,087,856**	**-**
		-	-	-	-	-	-	-	-	-	-	-	-	**-**	**-**	**-**
	Total- BDT		**1,684,456**	**-**		**2,040,156**	**-**		**1,042,604**	**-**		**884,608**	**-**		**5,651,824**	**-**
	Total- USD	**-**	**16,375**	**-**	**-**	**19,832**	**-**	**-**	**10,135**	**-**	**-**	**8,599**	**-**	**-**	**54,941**	**-**

5 Annexure

5.1 Case Study-1

Crablet Nursing Creating Hope in Crab Sector

Khidir halder is a crab farmer of Porakatla crab farming group at Shyamnagar Upazila in Satkhira district. He got married after very completion of his education but he was unemployed then. Finding no other income generating sources he engaged himself as a day labor and was practiced crab fattening as a secondary income source to carry out his family expenditure. When “Promotion of Sustainable Crab Farming in South-West Region of Bangladesh” intervention by NGF entered into their village he enrolled himself as a crab farmer. He was enthusiastic of crab farming and received training on “good aquaculture practices (GAP), improved nursery & grow out management”. The training covered, pre-stock pond management, soil and water quality maintenance, optimum stocking density against pond size and crablet size, post-stock farm management, Feeding schedule and feed amount calculation, post-harvest management etc.

According to his eagerness Khidir was selected as crab let nursing demo farmer and he was prepared his 5 decimal nursing pond following training guideline. Then he was supported with nylon net and bamboo slate fence cost, aqua inputs, 2000 pieces of crablets and feeding cost for crablet nursing demonstration. Before stocking he installed a 20 m^2 happa in the nursing pond and after taking crablet from NGF-Crab Hatchery he disinfected these crablets by formalin and then acclimatized with pond water and then released the crablets to the happa net. Khidir fed the crablets with boiled shredded tilapia for the first 3 days. After 3 days he released the crablets from happa to nursing pond and counted the surviving numbers before releasing. He was surprised, he got 1805 crablets at the time of releasing from happa nets to nursing pond which was around 90% survival rate. Then he encouraged more and took care his nursing pond more carefully. He fed twice daily with minced tilapia fish for three months and monitored the water quality of his pond for weekly basis. After 3 months of nursing he found that the average size of juvenile crab in his farm was 60 g. Therefore, he decided to harvest and within 10 days he harvested all the juveniles and he got 1300 pieces of juvenile (65%) crab weighted as 78 kg. He sold these at the rate of Tk. 380/kg which equals to Tk. 29640 as a whole. His total expenditure was Tk. 9500 means he earned Tk. 20, 140 by nursing crablet for three months. He is very happy now and planning to go for next cycle and also disseminating this success messages to other crab farmers.

5.2 Case study-2

Reshma Khatun a successful crablet nursing entrepreneur

Reshma Khatun, a 35 years aged woman of new entrepreneur of crablet nursing at Koyra Upazila in Khulna District. She is a mother of one son and one daughter and she has six family members. Her husband is a agriculture labor and earned little to carry out his family solvent. So, they lead a very under privileged life without social dignity. Therefore, Reshma always intend to do something to support her family but as she lived in a climate vulnerable area the opportunity of income is very shuttle after doing all her household chores. Meanwhile, "Promotion of Sustainable Crab Farming in South-West Region of Bangladesh" intervention by NGF entered into their village and by she informed that this project is including interested crab farmers as project participants and will provide training on crab farming technologies. So, she thought that crab farming is a good option for herself as an secondary occupation along with household activities as the same needs little land, little labor and low investment and she engaged herself in this project as project beneficiaries. She was very interested of crab farming and received training on "good aquaculture practices (GAP), improved nursery & grow out management". The training covered, pre-stock pond management, soil and water quality maintenance, optimum stocking density against pond size and crablet size, post-stock farm management, Feeding schedule and feed amount calculation, post-harvest management etc. According to his keenness Reshma was selected as crab let nursing demo farmer and with her training knowledge she prepared her 5 decimal pond for demonstration pond. At the very first she discharged her pond water and remove the bottom quagmire and left for drying out the pond. Then she completed all the steps of pre-stocking following the according to the guideline. Before stocking she installed happa net of 20 m^2 in her demonstration pond. At stocking she received 2000 pieces of crablets from NGF-Crab Hatchery and after transporting to her pond she disinfected these crablets by formalin and then acclimatized with pond water and then released the crablets to the happa net. Reshma fed the crablets with boiled shredded tilapia for the first 3 days. After 3 days she counted the survived crablets and got 1716 crablets, surprisingly which was about 86% survival rate then released to her nursing pond. Then she became confident that this crablet nursing could turn her life and encouraged more to take care vigilantly. She fed twice daily with minced tilapia fish for three months and monitored the water quality of his pond each week. After 3 months of nursing she observed that the average size of juvenile crab was around 60 g in average. Therefore, she decided to harvest and within a week she harvested all the juveniles and she got 1296 pieces of juvenile (64.8%) crab weighted as 77 kg. She sold 50 kg of Juvenile at the rate of Tk. 370/kg which equals to Tk. 18500 and the rest she released into another 10 decimal pond for grow-out culture which she took lease from her neighbor. For nursing crablet her expenditure was Tk. 9500 in total and from the sold 50 kg juvenile she got Tk. 18,500 means already profited Tk. 9000. She hopes that from the grow-out culture of 27 kg juvenile she will be profited at least Tk. 20,000. So, now she is enjoying the crablet nursing technology and disseminating her success messages to other crab farmers.