CENTRE FOR COASTAL AQUACULTURE

MOOLAPALAM VILLAGE, SOMPETA MANDAL, SRIKAKULAM, ANDHRA PRADESH

FEASIBILITY REPORT

(PHASE I)

NATIONAL FISHERIES DEVELOPMENT BOARD (NFDB)

October 2023

Consultant:

KULA AQUA
CONSULTANT PVT LTD
Chennai, India.

Contents

1. Introduction

Fisheries and aquaculture remain an important source of food, nutrition, employment and income for millions, especially the rural populations. In fact, the sector provides livelihood to about 25 million fishers and fish farmers at the primary level and twice the number along the value chain. Globally, the scientific institutions and R&D centres are inventing new technologies and innovations for farmers or entrepreneurs for achieving higher productivity and there by facilitating intensive farming practices. However, there is a need for further diversification, intensification and adoption of advanced technologies to transform the Indian aquaculture into a modern and thriving sector. In view of these NFDB developed such facilities under the name of NFDB Centre for Coastal Aquaculture and initially in phase-I.

1.1. Objectives

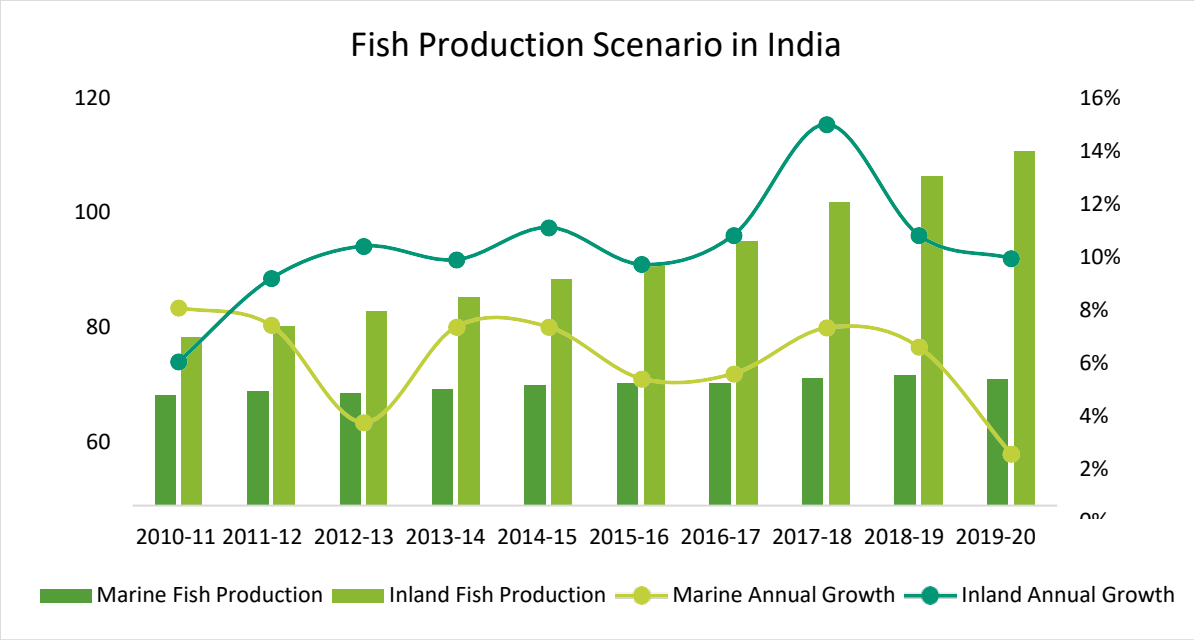
- To utilize the land for fishery activities.
- To produce marine finfish and mud crab, thus enhancing fish production
- To generate employment to the local populace.
- To generate revenue through fish and crab culture.

1.2. Overview of the Industry

Fisheries and Aquaculture constitute an important economic activity, with a vast potential for sustainably harvesting a wide variety of Inland and Marine Fisheries resources in the Country. India, as a key player in global seafood supplies, now ranks second after China in Aquaculture production. Indian seafood products are being exported to more than 100 countries across the globe.

India is the 2nd largest producer of Fish in the world and about 68% of India's Fish comes from the Aquaculture Sector. Fisheries Sector has a double-digit average annual growth of 10.87% since 2014-15 with record Fish production of 145 Lakh Tons in FY.2020-21 (provisional). 74% of Fish production was contributed by Inland Fisheries and the rest 26% was contributed by Marine Fisheries in FY.2020. The Sector employs 28 million Fishers and Fish Farmers are engaged at a primary level in the Fisheries and

Aquaculture Sector. Export earnings from the Fisheries Sector was $6 Bn. during 2020-21 and India's top export destinations for Fish and Fish products are China, USA, Southeast Asia, European Union, and Japan.



Source: Department of Fisheries, States Government / UTs Administration

While the overall Fish production in the Country over the last 9 years has grown at a CAGR of 6.2%, the growth was predominantly driven by the Inland Fish production that increased at 8.6%CAGR from 49.1 Lakh Tonnes in FY.2011 to 104.4 Lakh Tonnes in FY.2020. The Marine Fish production lagged at 1.5% growth because of the lack of ecosystem and sufficient infrastructure to encourage the Sector till recently.

1.3. Status of Aquaculture of Marine Fin Fish & Crab in Andhra Pradesh

Andhra Pradesh stands first in total fish and prawn/shrimp production in India for a long time, both in terms of production and value. The CAGR of Maine fisheries in AP is 2.98% whereas the national CAGR for the same period is 1.38%. The CAGR of Maine fisheries in AP is 2.98% whereas the national CAGR for the same period is 7.68%. The CAGR of Inland fisheries in AP is 11.22% whereas the national CAGR for the same period is just 5.58%. In fact, the aqua and marine production of Andhra Pradesh has more than doubled in the past decade from 16.03 lakh MT in 2011-12 to 41.74 lakh MT in 2019-20.

Fishing and Aquaculture accounts for INR 11,887 crores (3.13%) of Andhra Pradesh's SGDP, which was INR 3,79,402 crores. While the state's GSDP growth rate was -2.58%, the sector's growth rate was 4.94% - which shows the importance of the Fishing and Aquaculture sector in state's growth.

Nine out of thirteen districts of Andhra Pradesh are along the coastline and the total length of the coast is around 974 KM. The total continental shelf is more than 33,227 Sq.km. The total potential area for brackish water fishing is around 1,74,000 ha. But presently the area under culture is around 37,245 ha involving more than 15,000 farmers. Mangrove wetlands of 28,200 ha is also promoting the brackish water aquaculture in the state. L.vannamei and P.monodon are the two predominant species in brackish water aquaculture in the state. Culture of marine finfish is in a rudimentary stage and needs to be improved by providing good quality nursery seeds for the farms and juveniles for the cages.

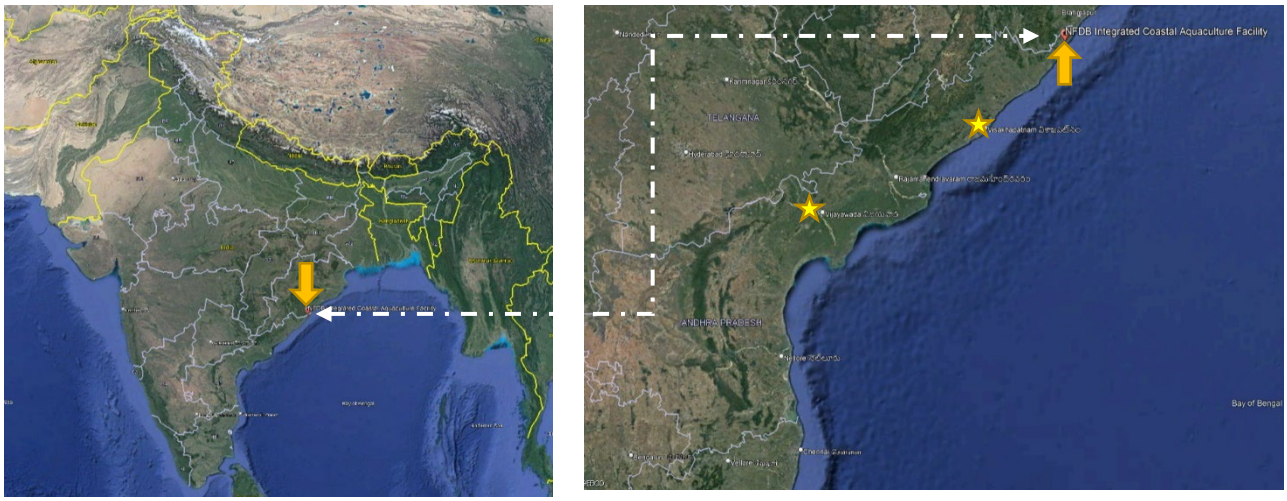
2. The Site

The total area acquired by NFDB at Mulapolam is 99.185 acres and located at Moolapalam Village, Sompeta mandal in Srikakulam District, Andhra Pradesh. The latitude is 18052'14" N and longitude is 84034'43" E. An extent of AC. 94.59 cents of private land of Mulapolam Revenue Village in Sompeta Mandal of Srikakulam District was acquired from the land holders duly observing land acquisition procedure and an extent of AC. 02.86 cents of Government poramboke land in the same village, total AC. 97.45 cents of land was handed over to NFDB by Tahsildar, Sompeta Mandal vide Rc. No. 176/2007/B dated 11.06.2010 and it is fenced. 1.735 acres of land is acquired for the purpose of inlet canal from sea and outlet canal and widening of road.

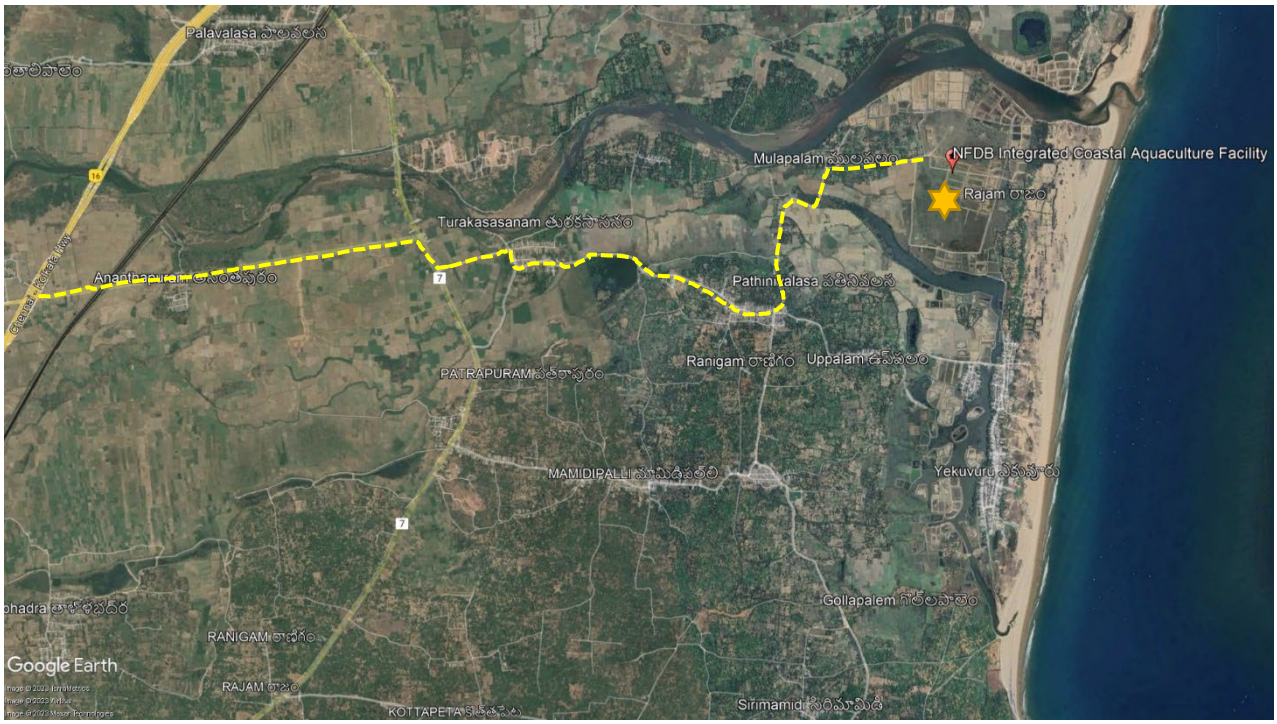
The site is well covered with water sources of brackish water at Northern part of the site, Mahendra Tanaya River, Sea water at eastern side of Bay of Bengal & freshwater from southern side of the site.

2.1.Connectivity to Site

The project site with co-ordinates 18052'14" N latitude and 84034'43" E Longitude, has fresh water, seawater and brackish water resources, making it more suitable for Coastal Aquaculture activities.



The project site has excellent road connectivity as it is connected to NH16 (Chennai – Kolkata) at a distance of 18 Km. via Haripuram.



The Site is 500 Mtrs. from the Sea Shore and abutting to the Mahendra Tanaya River at the Confluence with Brackish Waters.

2.2.Characteristics of the Site

- The site is in the Northern Coast of Andhra Pradesh which is 228 Km from Visakhapatnam, with Mahendra Tanaya River in the Northern side is at a distance of 150m
- The site is 580 m from the sea coast and is falling in CRZ-III
- Above characteristics make the site suitable for taking up aquaculture activities for any species requiring fresh, brackish and sea water
- The site is well covered with water sources of brackish water at Northern part of the site, Mahendra Tanaya River
- The site has access to Sea water at eastern side of Bay of Bengal through a pumping station built up near the sea with one direct sea water intake system and one beach borewell system.
- The site has got an access to freshwater from southern side of the site. within the site currently there is borewell to supply the water requirement for all potable purpose.
- Site is connected by a 11 KV line and currently we have 500KVA transformer to supply power, supported by 1no of 250 KVA and 1 no of 125 KVA generators.
- The site is well connected by rural roads. It is nearly 3 to 4 km from the state roads and 7 to 8 kms from the national highway.
- Within the site all the facilities are interconnected by 3m wide concrete roads.

3. The Project

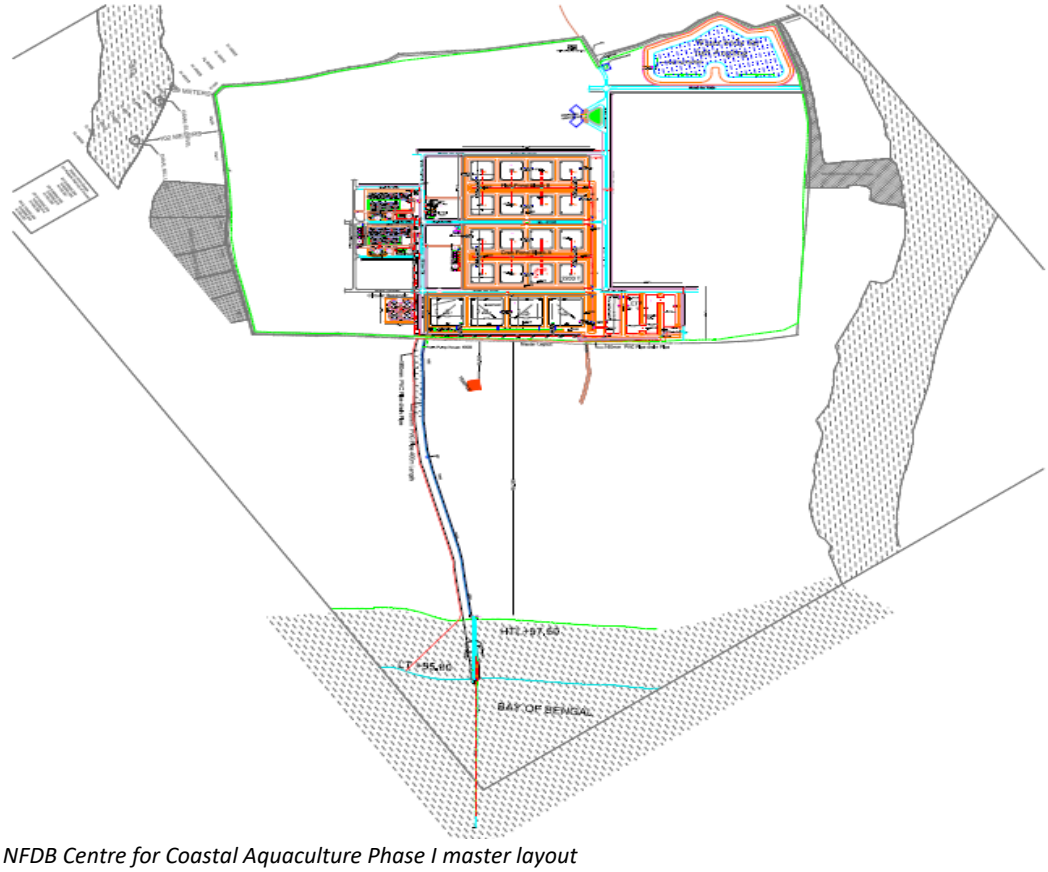
3.1. Outline

As of now Marine fisheries is mostly capture based in the country and resources are also over exploited and catches are depleting. In order to give impetus to marine fisheries, it is proposed to focus more on marine and brackish water alternative species culture for which both breeding and culture technologies are standardized. In order to achieve sustainable development in culture based marine fisheries subsector, the following schema of model is proposed at Mulapolam site

(1) Encourage marine culture along the coast through cage culture and aqua ponds and
(2) Sea ranching for enhancing the fish stock in natural resources.

3.2. Project Master Plan

Considering the features of the land with respect to its surroundings, a master plan for the project has been prepared with the following components in Phase 1 of the project for which the designs has been worked out. The proposed Master Plan of the Phase 1 Coastal Aquaculture Facility at Mulapolam is as provided below:



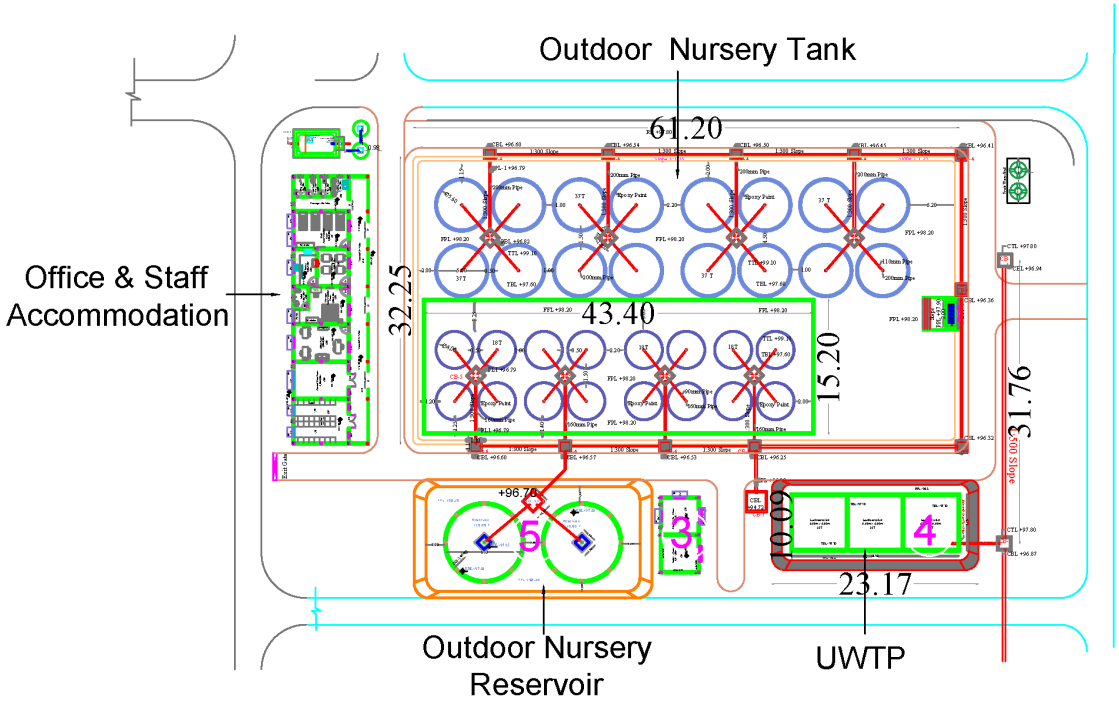
NFDB Centre for Coastal Aquaculture Phase I master layout

3.3. Project Components as per Master Plan – Phase 1

- Nursery Rearing tank Complexes 2 nos. for nursery rearing of Marine Fin Fish & crab
- Two blocks of Grow out Earthen Ponds (Block-A & Block-B) for farming of marketable size Marine Fin Fish (Cobia, Pompano & Sea Bass) and Mud Crabs
- Water Management System: Sea Water Intake and Outlet Arrangements, Filtration, Fresh Water Supply with Pipelines, Outlet Channels.
- Earthen Sea water Reservoir - 4 nos.
- Raw seawater Circular Reservoir 1 no.
- Effluent Treatment Plant

3.4. Detailed Description of each Components in Phase 1

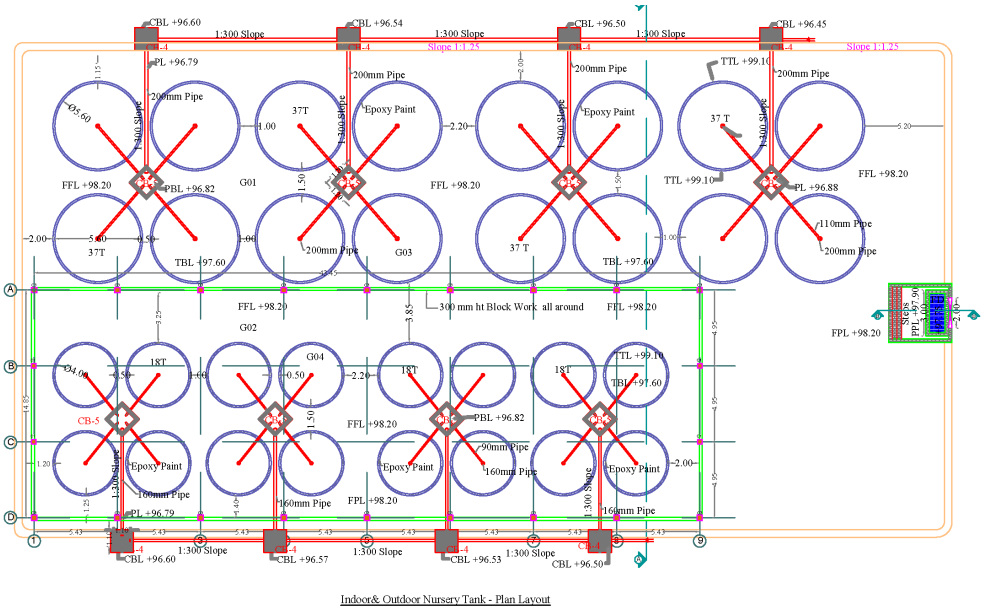
3.4.1. Nursery Complex for Fish Rearing – 2Nos



NFBD Centre for Coastal Aquaculture - Nursery Complex

Each complex will have the following components.

1. Nursery Building:



NFBD Centre for Coastal Aquaculture – Indoor & Outdoor Nursery

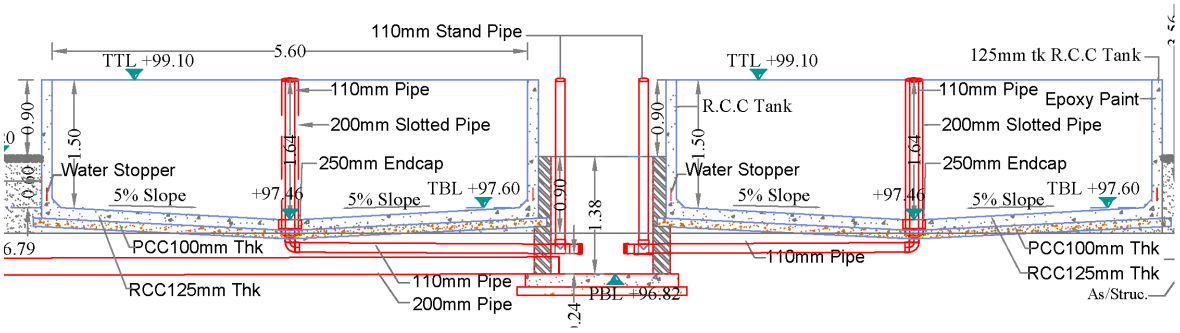
a) Indoor Nursery Tanks:

An Indoor facility with 16 tanks of 4m diameter concrete tanks with a gross capacity of 18 T each. This facility will be used to rear the small Fry to bigger sized Fingerlings. The system will be able to handle nearly 0.5 million Fry per batch. This

facility will have roof on the top and will be open on all the four sides including gable ends.

b) Outdoor Nursery Tanks:

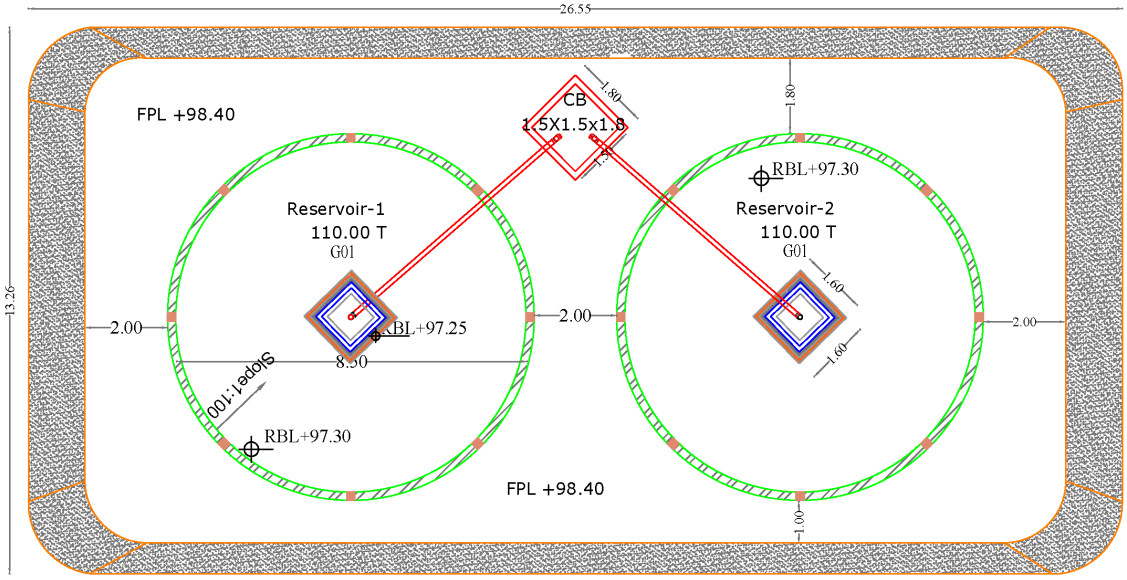
An outdoor facility with 16 nos. of 5.6m diameter concrete tanks with gross capacity of 37T each. This facility will be used to rear the early Fingerling to advanced Fingerling or to the juvenile size. This facility can handle nearly 1 million Fry or 0.5 million Fingerlings per batch. Capacity will depend on the stocking size and the harvest size and also as per the species of Fish.



NFBD Centre for Coastal Aquaculture - Outdoor Nursery Tanks

2. Treated Water Reservoirs:

Two reservoirs of 8.5 m diameter HDPE lined tanks of 110 T gross capacity each are constructed by making the circular walls of the tank using framed concrete columns and beams with concrete block works and concrete central drainage system, keeping the other bottom as earthen base. The tanks will be completely lined on the inner side using the HDPE liners to make the tanks totally waterproof. Water is filtered through a set of sand filter, activated carbon filter before the water enters the treated reservoirs.

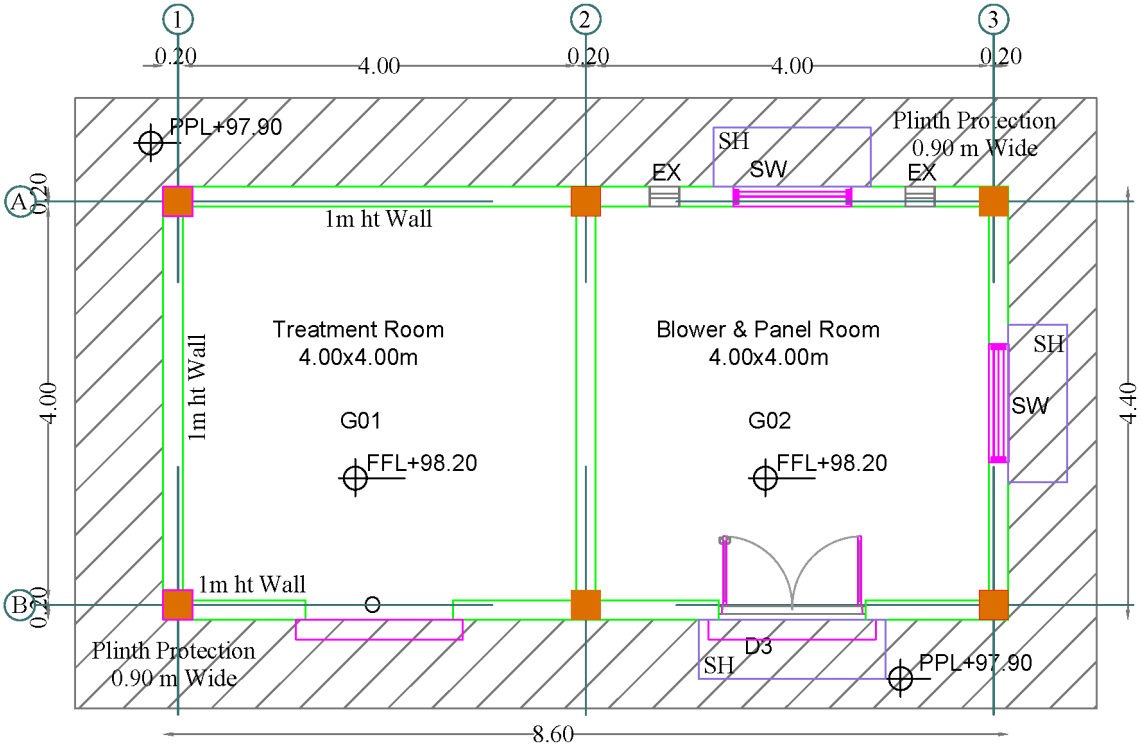


Plan Layout

NFBD Centre for Coastal Aquaculture – Treated Water Reservoirs

3. Water Treatment cum Blower cum Panel Room:

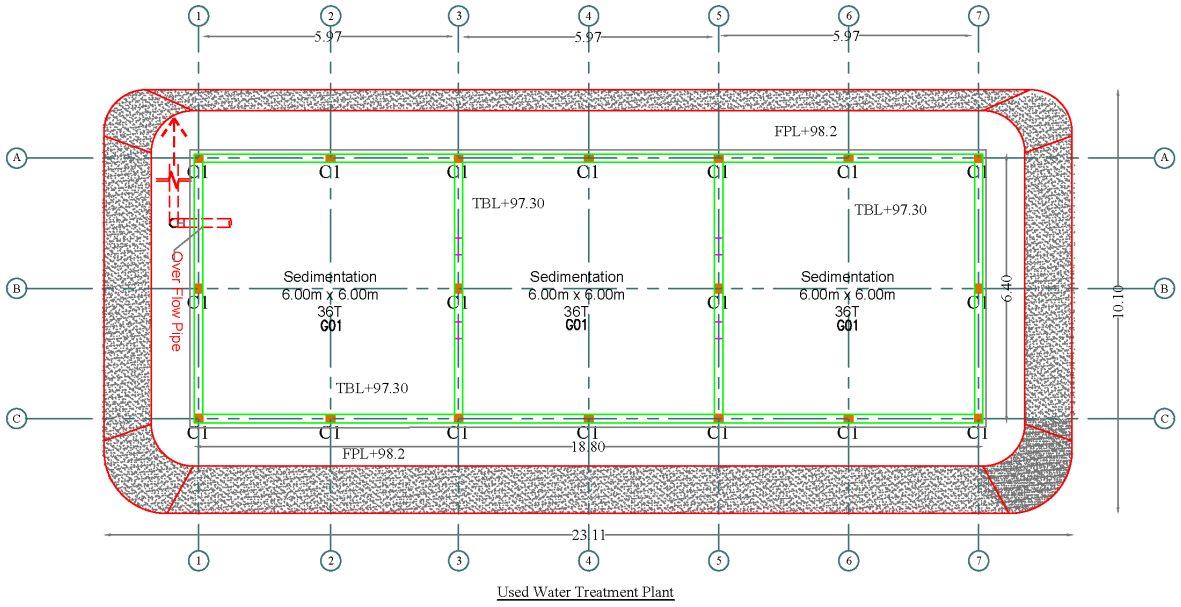
There will be a room (11.6mx6.4m) to house the treatment plant, blowers and the panel boards.



NFBD Centre for Coastal Aquaculture – Blower cum Panel Room

4. Used Water Treatment Plant:

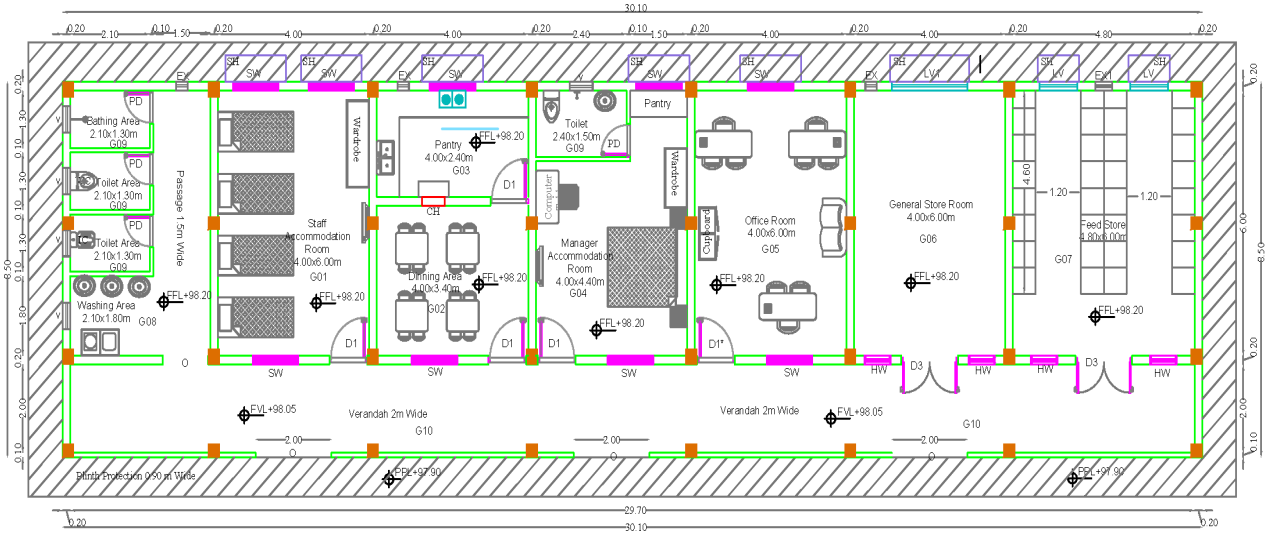
This facility is required to treat the drain water from the nursery tanks and then drain to central ETP. This consists of three tanks of 36T each made of framed concrete walls with concrete blocks, earthen base with complete inner lining using HDPE material for water proofing.



NFBD Centre for Coastal Aquaculture – UWTP

5. Office cum Accommodation:

This facility consists of an office, manger accommodation, technical staff accommodation, feed store room, general stores, canteen, and common bathroom facilities with total area of 510 m2 (30 m x 8.5m).



Nursery - Office & Accommodation - Plan Layout

NFBD Centre for Coastal Aquaculture – Office Cum Accommodation

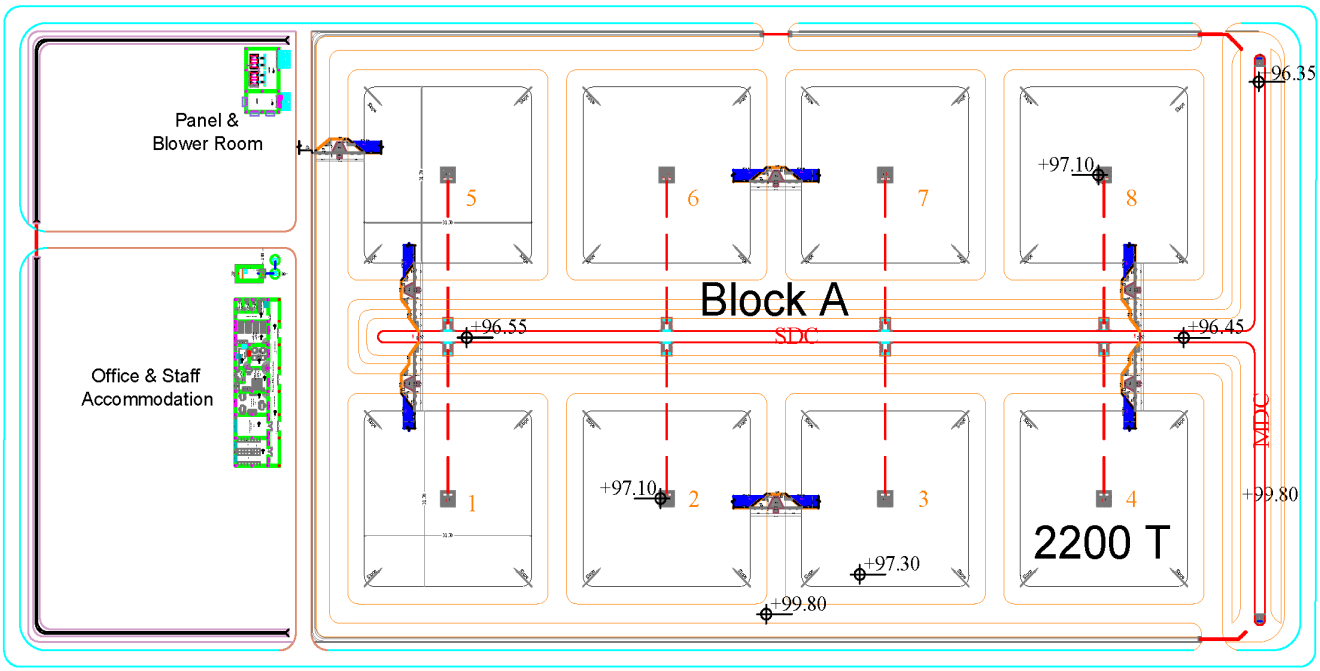
6. Freshwater Tank:

A ground level platform has been created to accommodate two 10 Ton Vertical HDPE tanks. Water from the outside source or from the borewell will be filled in to these tanks. The water from this platform will be supplied to the entire facility using pressure pump.

7. Septic Tank:

Septic Tank has been proposed for the accommodation as per standards with soak pit arrangement.

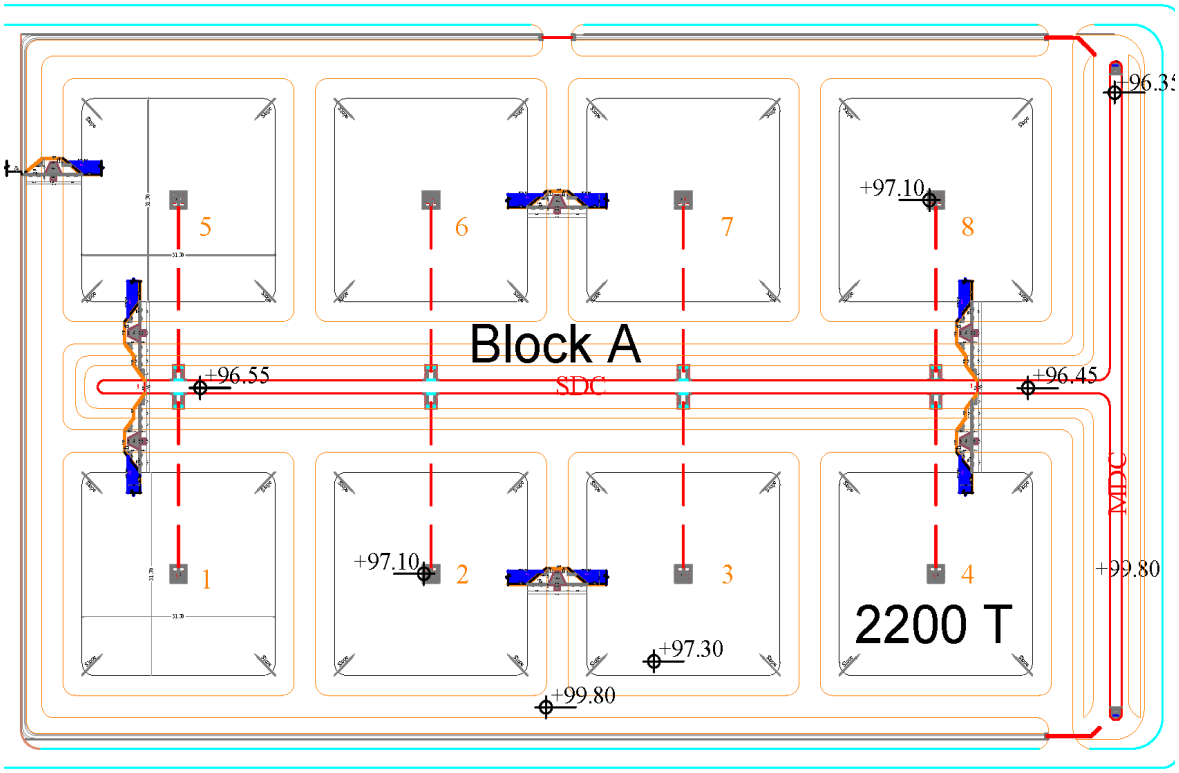
3.4.2. Grow Out Pond System (Block A) for Crab



NFBD Centre for Coastal Aquaculture –Growout Complex

1. Grow Out Ponds

There will be 8 numbers of 0.1 Ha ponds with water holding capacity of nearly 1600 m3 in each pond. All the ponds will be constructed with earthen dyke and HDPE lined on the dyke only. These ponds will have piped water supply from reservoirs.



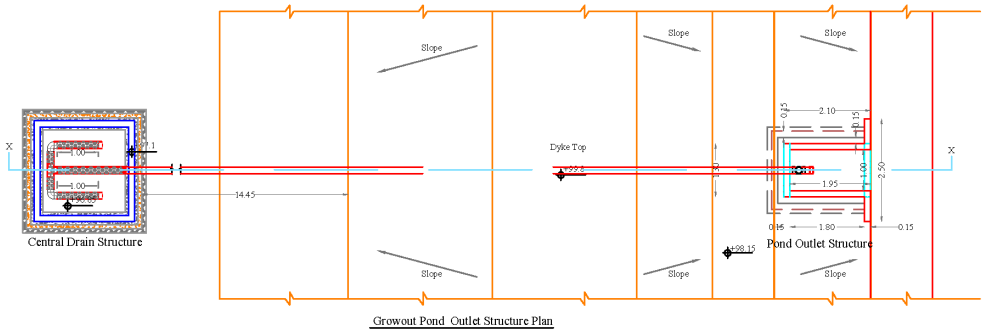
NFBD Centre for Coastal Aquaculture – Lined Growout Pond (Block A)

a. **Central Drainage:**

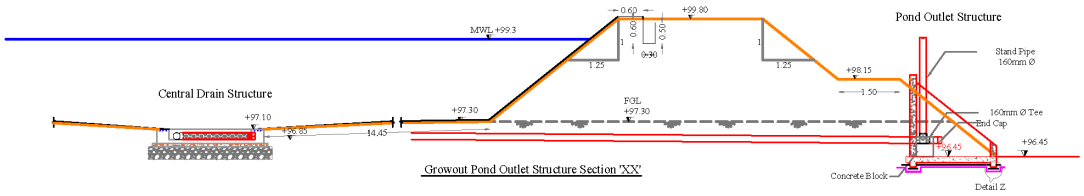
A central drainage points in the centre of pond constructed in concrete with embedded HDPE polylock on the edges for fusion with the HDPE liners to provide water tight jointing. A pipeline from this structure is laid at a suitable depth to the reach the outlet structure on the drainage canal. Entry side will have perforated vertical and lateral pipes covered by mesh scree to prevent the escape of the reared Fishes

b. **Outlet Structure for Ponds:**

Outlet structure for the ponds will be on the outer side of the pond in the drain canal, with stand pipe controls to regulate the water drainage from the ponds. These structures are as shown in the drawing.



NFBD Centre for Coastal Aquaculture –Growout Pond Outlet Structure



2. **Office cum Accommodation cum Store:**

   This facility consists of an office, manger accommodation, technical staff accommodation, feed storeroom, general stores, canteen, and common bathroom facilities with total area of 510 m2(30mx8.5m)

3. **Panel cum Blower Room:**

   There will be a 11.60mx6.40m building to accommodate the panels and blowers required for aeration of the ponds. The aeration will be done through a network of pipelines.

4. **Freshwater Tank:**

   A ground level platform has been created to accommodate two 10 Ton Vertical HDPE tanks. Water from the outside source or from the borewell will be filled into these tanks. The water from this platform will be supplied to the entire facility using pressure pump.

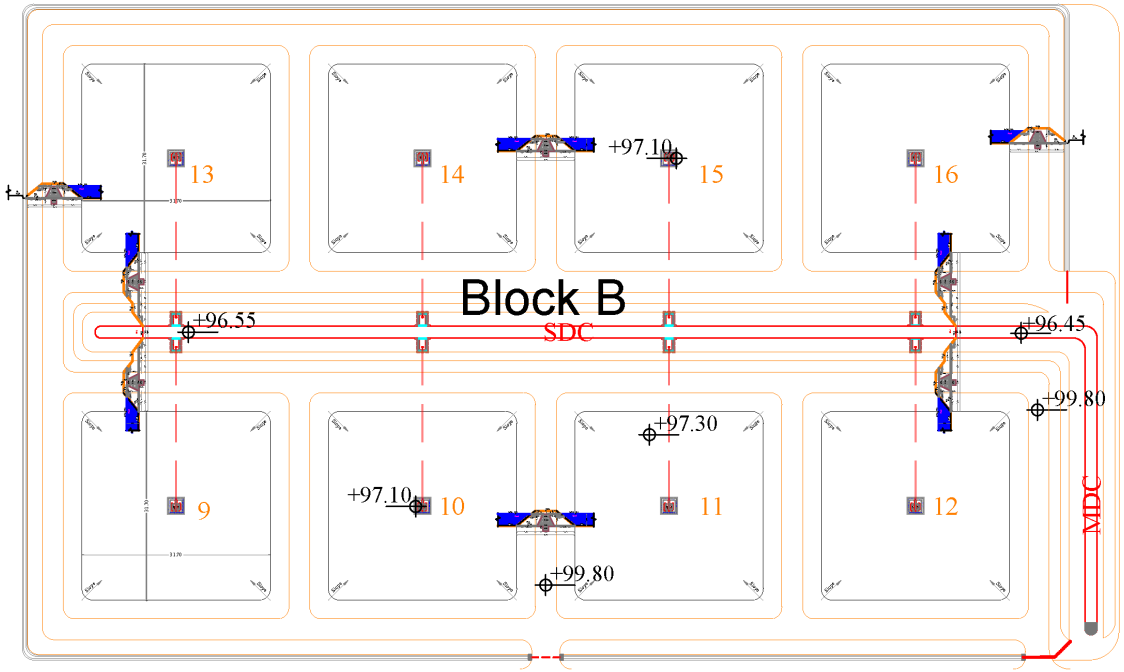
5. **Septic Tank:**

   Septic Tank has been proposed for the accommodation as per standards with soak pit arrangement.

3.4.3. Grow Out Pond System (Block B) for Fish

1. Grow Out Ponds

Lined: There will be 8 numbers of 0.1 Ha ponds with water holding capacity of nearly 1600 m3 in each pond. All the ponds will be constructed with earthen dyke and covered completely using HDPE liners. These ponds will have piped water supply from reservoirs.



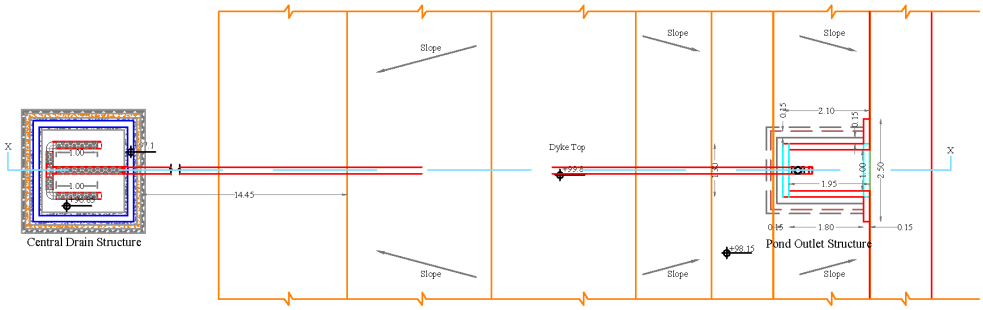
NFBD Centre for Coastal Aquaculture –Growout Pond (Block B)

a. **Central Drainage:**

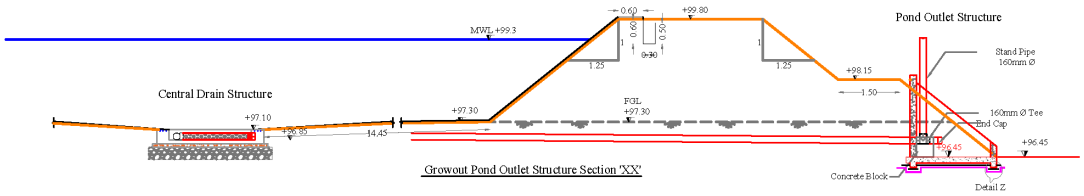
A central drainage points in the centre of pond constructed in concrete with embedded HDPE polylock on the edges for fusion with the HDPE liners to provide water tight jointing. A pipeline from this structure is laid at a suitable depth to the reach the outlet structure on the drainage canal. Entry side will have perforated vertical and lateral pipes covered by mesh scree to prevent the escape of the reared Fishes

b. **Outlet Structure for Ponds:**

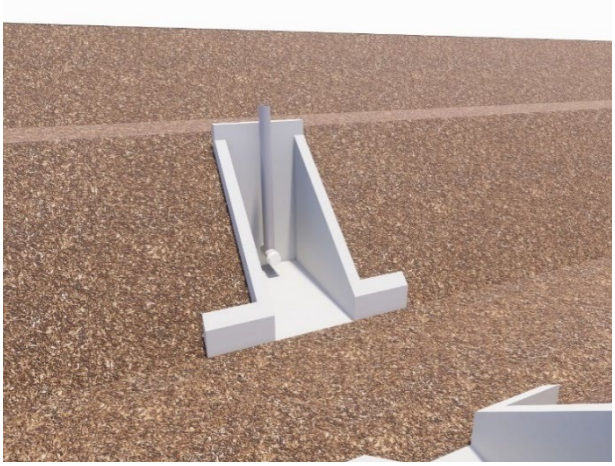
Outlet structure for the ponds will be on the outer side of the pond in the drain canal, with stand pipe controls to regulate the water drainage from the ponds. These structures are as shown in the drawing.



Growout Pond Outlet Structure Plan

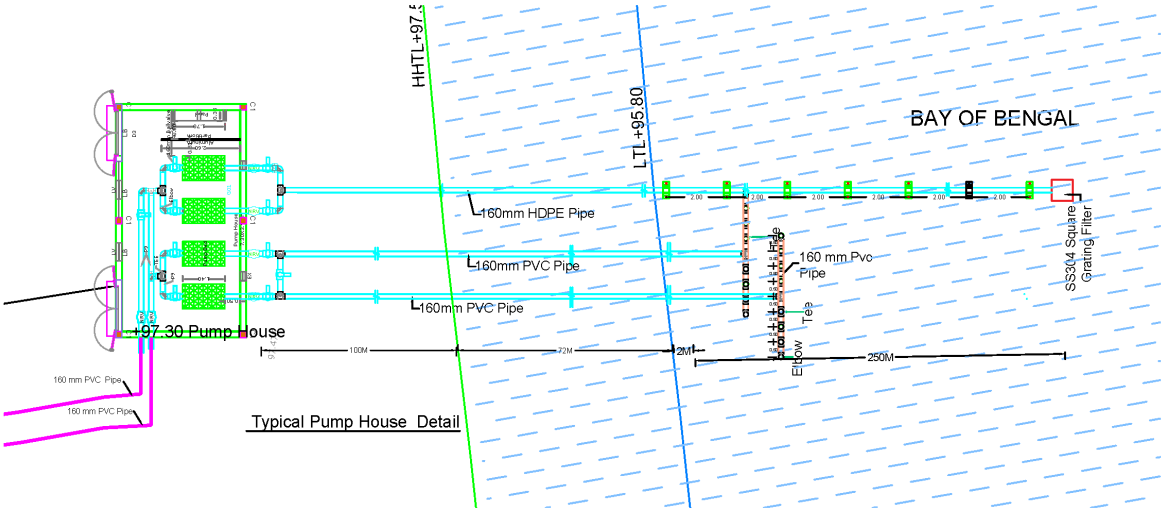


Growout Pond Outlet Structure Section 'XX'



3.4.4. Sea Water Supply System

Sea water Supply system consists of intake suction line to bring the water to the pumps, pump station and the delivery pipe line up to the reservoir.



1. **Sea Water Intake System:** Two types of intake suction line have been installed in the project as below

   a) **Beach Borewell System**:

   There will be two sets of beaches bore well system with individual header suction line to individual pumps. Each set will have a network of 8 bores of 160mm PVC pipe with required fittings and accessories as shown in the sketch. These shallow bores are done up to a depth of 8ft from the ground level in the location just below the lowest low tide level of the locality. All the 8 bores will be suitably coupled together to a common suction line leading to one pump. Similarly, the next set of 8 bores have to be connected to the second pump. The delivery from the two pumps will be connected together to a common header and from the header one single delivery line will take the water to the circular primary reservoir.

NFBD Centre for Coastal Aquaculture –Beach Borewell Pipeline

The beach bore well system is designed for 150m3 per hour supply to the primary reservoir.

NFBD Centre for Coastal Aquaculture – Beach Borewell Individual Suction Pipes

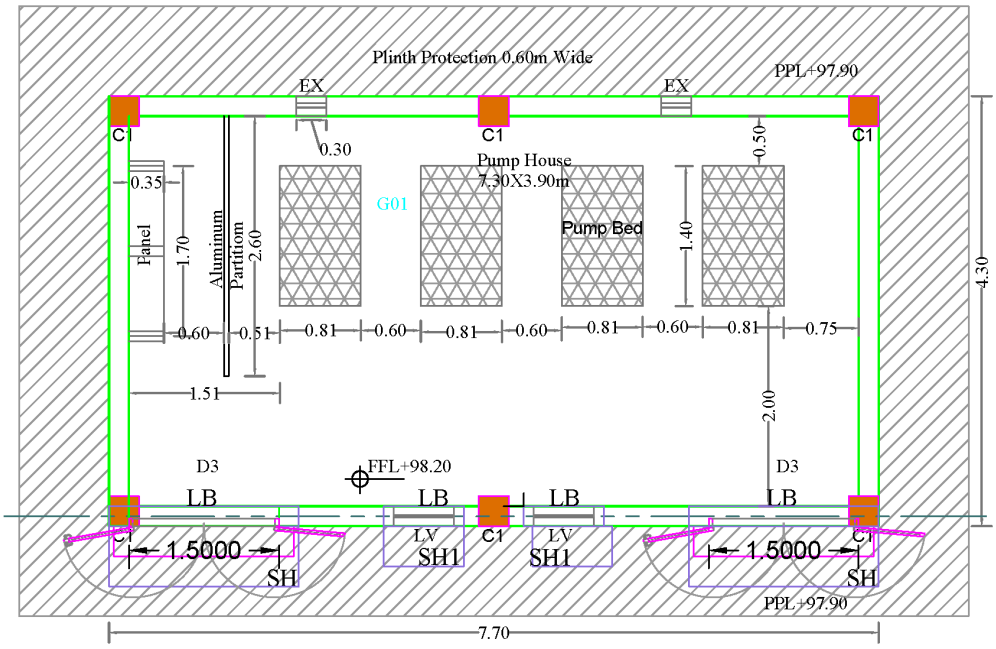
b) **Open Sea Water Intake System**:

There will be one single intake pipeline made of HDPE to be installed to have the end of suction line at the depth of – 2.5metre from the LLTL with proper strainer at the end and anchoring to keep them in position against the tides. There will be set of concrete blocks each weighing 30kg to be kept at the top and bottom bolted with stainless steel bolts and nuts with suitable rubber padded grips to keep the block in position without moving. The entire pipeline will be 425 metres from the pumphouse to the suction end of the pipeline inside the sea. There will be 320 metres of pipelines requiring concrete block anchor at a spacing of 2 metre each to keep the pipelines in position at the bottom. As a part of

NFBD Centre for Coastal Aquaculture – Sea Water Intake Pipeline with anchor blocks

installation, these blocks will be arranged in the pipeline and the whole pipeline will be moored in to the sea and immersed in position by suitable technical executors.

2. **Pump House:** A pump house to accommodate four numbers of 20 hp pumps has been planned to supply water to the reservoirs. For each intake system, there will be two pumps, one as working and the other as stand by.



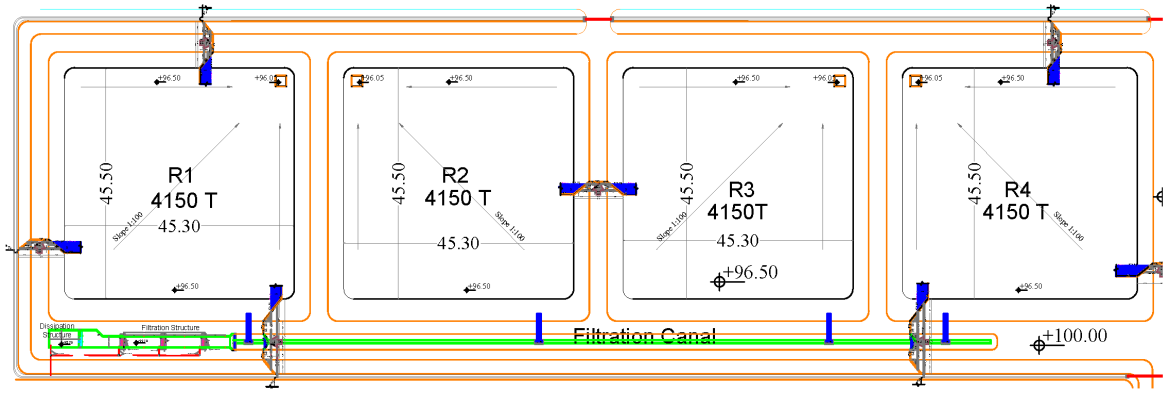
NFBD Centre for Coastal Aquaculture – Pump House

3. **Main Water Supply Line:** The water from the pump house will be carried over a distance of nearly 500 m through a set of pipelines to the reservoir ponds and to the primary circular reservoir separately but could be redirected to one another by a control system

3.4.5. Reservoir Systems for Sea Water

1. **Reservoir Ponds**

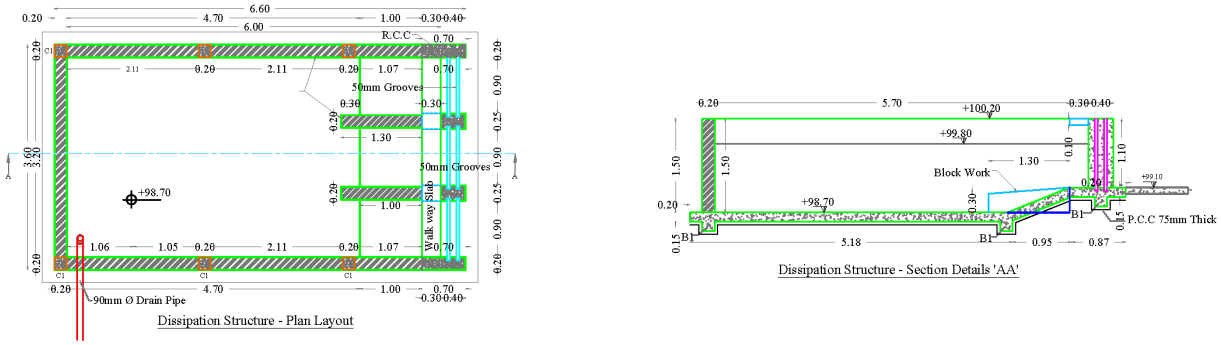
There will be a network of four reservoir ponds (R1, R2, R3 and R4), each of size 2060 m2 with water storage capacity of 4150 m3. Total reservoir capacity will be 16600 m3. These reservoirs can meet the daily requirement of the two pond systems at a maximum water exchange of 20 percent per day. These are earthen ponds with HDPE Liner on the top covered for the entire inner side of the reservoir ponds.



NFBD Centre for Coastal Aquaculture – Reservoir Pond

2. Dissipation box and Filtration system

These reservoirs will receive water from the sea through a sequence of dissipation box in the beginning with a three set of filtration systems having bag filter screens of different mesh sizes of 100 mesh,80 mesh and 60 mesh in a sequence.



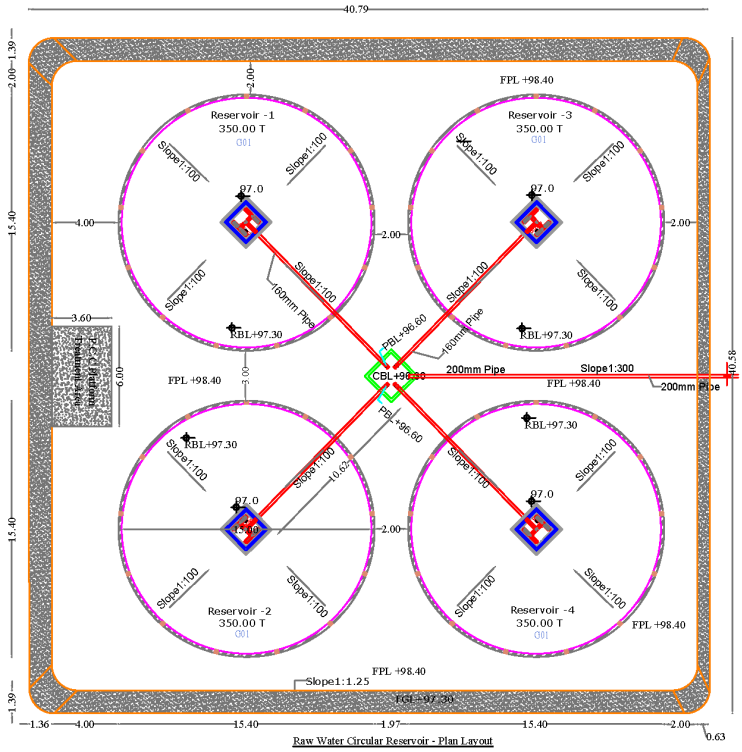
NFBD Centre for Coastal Aquaculture – Dissipation Box

3. Feeder Canal and Inlets

Post filtration, water will be supplied to the individual reservoirs through inlet pipes installed in the HDPE lined open trapezoidal feeder canals. Water from the reservoirs will be pumped using water pumps directly in to the pond systems A and B through a network of pipelines and controls.

3.4.6. Primary Circular Reservoir Tanks

There will be a network of 4 reservoir tanks, each of which has 350T gross capacity. These reservoirs supply water to the secondary treated water reservoirs positioned in all the hatchery complexes, nursery complexes, Recirculating systems complexes, Intensive circular grow out tank's complexes and other facilities in the project to be executed in different period of time in a sequence.



NFBD Centre for Coastal Aquaculture – Primary Circular Reservoir Tanks

3.4.7. External Works

Many works have to be done as a common activity for effecting water supply and drainage system for process water, rainwater drainage system, Road systems, etc.,

a) Process water drainage system

It consists of a network of pipeline suitably connected from the used water treatment of individual units to carry the water to the sedimentation point of the ETP. These pipeline systems will have inspection chambers at suitable intervals, junction points and in direction change points.

b) Rainwater Drainage System

It is basically an earthen canal along the sides of the road to carry the rainwater to the exit point of ETP with proper crossing culvert pipes across all the roads.

c) Road System

There is a network of CC (Cement Concrete) roads in the project connecting all the individual units. The main road will be developed to 4 metres. Sub roads will be developed to 3m width.

3.4.8. Infrastructure for Electrification

To get the HT connection to the site and to carry the HT cable to the location of the transformer and further tapping to distribute to all facilities, we need the following infrastructure for the project:

a) Main Consumer EB yard

The HT power will be tapped at this point through VCB (Vacuum Circuit Breaker) and we need a platform to install them. It has to be protected by fencing all around with stone filling on the floor premises.

b) Pipe System for HT cable:

To carry the HT cable from the point of entry to the point of the Transformer Yard, hume pipes with inspection chambers at entry, exit, change of directions, periodical intervals of 25m along the straight directions have been planned.

c) Transformer Yard:

A fenced yard with platforms to keep the transformer has been planned at a central location.

d) MV Panel Room

To get the LT power tapping in to the system, set of equipment's and panel boards have to be installed for which as per standards the facility has been planned. To accommodate the generators, suitable platforms as per standards have been provided along with this facility.

3.4.9. ETP and Other Borrow pits

a) ETP:

This will be at a lower level and so it is a good source of soil for us and serve as borrow pit for the soil required for reservoirs, pond systems. Water from all the process facilities of the project will be drained in to the Effluent Treatment Ponds before discharging them in to the creek. It will have two different sections as Sedimentation Ponds and Depuration Ponds. Water from all the Ponds will reach the sedimentation pond through a master drain culvert in the end of the master drain canal while the process water from nursery will reach through a network of drainage pipe system to this entry point of the sedimentation. From sedimentation, it will flow to the depuration

ponds through a controlled sedimentation culvert structure, after which water will flow to the creek through a final ETP culvert control structure.

b) Water Body for Angling:

The location earmarked as borrow pit area will be converted in to a recreation facility for angling in future. For the time being the dykes will be formed around. It is designed to have a walkway and a garden around this facility in future.

4. Operation Details

The facilities in phase I will have the following production and support units

Production Units

1. Nursery Rearing tank Complexes 2 nos. for nursery rearing of Marine Fin Fish & crab. In the current analysis it has been considered that both the nurseries will be used for fish. This is due to the fact that the stake holders are not keen on using the concrete tanks for crab nurseries.
2. Two blocks of Grow out Earthen Ponds (Block-A & Block-B) for farming of marketable size Marine Fin Fish (Cobia, Pompano & Sea Bass) and Mud Crabs. In the case of marine fin fish Growout, Seabass production have been considered due to the demand by the stake holders. In the case of mud crab Growout ponds, pen type culture has been considered to offer flexibility from crablet to juvenile crab to market size of 250gms, 500gm, 750gm in the same pond.

Support Units

1. Water Management System: Sea Water Intake and Outlet Arrangements, Filtration, Fresh Water Supply with Pipelines, Outlet Channels.
2. Earthen Sea water Reservoir - 4 nos.
3. Raw seawater Circular Reservoir 1 no.
4. Effluent Treatment Plant

All the operation details in the different units specified above, their operational and biological parameters have been acquired through expert consultation and have been presented in the tables below to guide the cost calculation.

Fish Nursery Complex – 2 Nos

Table 4.1: Fish Nursery Biological & Operational Factors with Specification Details

S. No	Description	Quantity	Unit
	Species Proposed: Seabass/ Pompano/ Cobia		
	Indoor Nursery Tanks	**Production Size:** Weaned fry to 3gms	
1	Size of the tank (Working Capacity)	17	m^3
2	Number of tanks	16	Nos
3	Total Tank Working Capacity	271	m^3
4	Stocking density of the fry	1500	Nos/m3
5	Number of fish fry stocked in one tank	25,434	Nos
6	Survival rate from weaned fry to 3gm	80%	Percentage
7	Number of fishes Harvested from this tank	20,347	Nos
8	Total Production from the 16 Tanks	3,25,555	Nos
9	Fish ABW at the time of Harvest	3	gms
10	Total Production from the 16 Tanks	977	Kg
	Outdoor Nursery Tanks	**Production Size:** 3gms to 20gms	
1	Size of the tank (Working Capacity)	36	m^3
2	Number of tanks	16	Nos
3	Total Tank Working Capacity	579	m^3
4	Stocking density of the fry	562	Nos/m3
5	Number of fish fry stocked in one tank	20,347	Nos
6	Survival rate from 3gm to 20gm	80%	Percentage
7	Number of fishes Harvested from this tank	16,278	Nos

S. No	Description	Quantity	Unit
8	Total Production from the 16 Tanks	2,60,444	Nos
9	Fish ABW at the time of Harvest	20	gms
10	Total Production from the 16 Tanks	5,209	Kg
11	No of Cycle per Year	6	Cycles

Fish Growout Complex

Table 4.2: Fish Growout Biological & Operational Factors with Specification Details

S.No	Description	Quantity	Unit
	Species Proposed: Seabass		
	Growout Pond	**Production Size:** 20gms to 750gms	
1	Size of the Pond	1005	m^2
2	Number of Ponds	8	Nos
3	Total Tank Working Area	8,039	m^2
4	Stocking density	6	Nos/ m^2
5	Number of fishes stocked in one Pond	6,029	Nos
6	Survival Rate	80%	Percentage
7	Number of fishes Harvested from this Pond	4,823	Nos
8	Total Production from the 8 Ponds	38,588	Nos
9	No of Cycle per Year	2	Cycles

Crab Growout Complex

Table 4.3: Crab Growout Biological & Operational Factors with Specification Details

S. No	Description	Quantity	Unit
	Species Proposed: Mud Crab		
	Growout Pond	**Production Size:** 10gms to 500gms	
1	Size of the Pond	1005	m^2
2	Number of Ponds	8	Nos
3	Total Tank Working Area	8,039	m^2
4	Stocking density	3	Nos/ m^2
5	Survival Rate	80%	Percentage
6	Number of crabs stocked in one Pond	3,015	Nos
7	Number of crabs Harvested from this Pond	2,412	Nos
8	Total Production from the 8 Ponds	19,294	Nos
9	No of Cycles per Year	2	Cycles

5. Costing

5.1. Capital Cost Expenditure (CAPEX)

The cost of development of these facilities has been worked out as per the construction

Table 5.1: Capital Cost of Individual Infrastructure in the project

S.No.	Description	Total
1	**Nursery Complex for Fish - Unit 1**	**2,82,30,916**
	(including Nursery area, reservoir, treatment cum blower cum panel room, used water treatment plant, office &staff accommodation, Freshwater tank, Septic Tank, overhead tank)	
2	**Nursery Complex for Fish - Unit 2**	**2,10,22,376**
	(including Nursery area, reservoir, treatment cum blower cum panel room, used water treatment plant)	
3	**Growout Ponds -Block A - for Crab (Lined only along the dyke)**	**2,41,86,443**
	(consisting of lined ponds, Office and staff accommodation, panel cum blower room, freshwater tank platform, septic tank)	
4	**Growout Ponds -Block B for Fish (Full Lined Pond)**	**1,18,54,735**
5	**Water Management System**	
5.1	**Sea Water Intake System**	**1,36,33,835**
	(consisting of Intake line, pump house and main water supply line)	
5.2	**Reservoir System**	**1,53,47,515**
	(consisting of Reservoir Ponds, Dissipation Box with Filtration System, Feeder Canals with Inlets, Sump for pumping)	
5.3	**Raw Water Circular Reservoir**	**57,60,861**
6	**Developmental Civil External Works**	**2,01,01,449**
	(including, Roads Process Water Drainage system and rainwater Drainage system including culverts)	
7	**Infrastructure for Electrification**	**1,99,98,338**
	(consisting of Street Light, Main Consumer EB yard, Pipe System for HT Cable, Transformer YARD, MV Panel room, Generator Bed)	
8	**ETP and Water Body for Angling**	**31,27,520**
9	**Admin Building**	**2,55,64,922**
10	**Preliminary Project Cost (Capitalized)on prorate for 36.52 acres**	**2,53,16,118**
	Total Project Development Cost -Phase 1	**21,41,45,027**

5.1.1. Pre-Operative Cost

Table 5.2: Pre-Operative Cost of the project

S.No	Description	Amount	Prorata / Acre	Phase I	Total
1	Land Cost paid to Revenue Department - 99.185 Acres	3,07,05,400	3,09,577	36.52 Acres	1,13,05,754
2	G.I. Chain link fencing along the periphery of the NFDB land including Guard Room	1,10,00,000	1,10,904		40,50,209
3	Statutory clearences from Forest Department	15,32,000	15,446		5,64,084
4	DGPS Survey for compensatory aforestation land	59,000	595		21,724
5	HT Line connection processing fee for 250 KVA	9,00,000	9,074		3,31,381
6	Consultancy fee for EIA EMP Study	20,19,275	20,359		7,43,499
7	APCZMA- processing charge for CRZ clearances	1,35,000	1,361		49,707
8	APPCB fee for Consent for Establishment	6,20,000	6,251		2,28,285
9	Pre Level Survey	9,440	-	-	9,440
10	Laying of Boundary stones for inlet and outlet channels	26,300	-	-	26,300
11	Restoration of Electricity at Site	10,150	-	-	10,150
12	DGPS Survey for applying for Forest Dept, permission	54,000	-	-	54,000
13	Consultancy fee for Soil studies, DPR with detailed estimates, drawings & designs	24,23,588	-	-	24,23,588
14	Transaction Advisory Consultancy for PPP setup	17,04,000	-	-	17,04,000
15	Transaction Advisory Consultancy for preparation of PFR and DPR for operationalization of Phase I	10,92,000	-	-	10,92,000
16	Conservation of olive Ridley Sea Turtle plan	25,00,000	-	-	25,00,000
17	HT Line Unconnected Monthly Minimum Charges from 20 June-2023 to 4 Aug 2023	2,02,000	-	-	2,02,000
	TOTAL				**2,53,16,118**

5.2. Operation Cost Expenditure (OPEX)

All the operational expenses have been calculated in detail. All the production units require different types of raw material and it has been worked out as per the different quantities required at different period of time during the cycle and the same is presented

5.2.1. Operational Cost Estimates for Fish Nursery – Unit 1

The planned size of production of Seabass in Nursery is 20gm fish for six cycle per year in 16 numbers of 17 m3 indoor and 36 m3 of 16 number outdoor tank for the production.

Table 5.3: Operation Cost for Fish Nursery – Unit 1

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Tank Preparation (Cleaning, Disinfection and filling)**					
1.1	Nursery Indoor System	Mandays	5	1,000	5,000	0.18%
1.2	Nursery Outdoor System	Mandays	5	1,000	5,000	
2.0	**Fry Cost**					
2.1	Nursery - Indoor system	Nos	4,06,944	7.5	30,52,080	54%
2.2	Nursery - Outdoor system (Transferred from Indoor)			No cost		
3.0	**Feed Cost**					
3.1	Nursery Feed (Indoor)	Kg	1,465	300	4,39,500	29.10%
3.2	Artificial feed attractant	LS	1	30,000	30,000	
3.3	Nursery Feed (Outdoor)	Kg	7,813	150	11,72,000	
4.0	**Chemical & probiotic cost**					
4.1	Probiotics	Kg	30	5,000	1,50,000	3%
5.0	**Power Cost**					
5.1	Pumping Cost - From Nursery Reservoir to Tanks					
	Initial Water Filling	Unit	191	3.85	736	3.86%
	Water Exchange (80% 2 times per day)	Unit	18,360	3.85	70,700	
5.2	Pumping Cost - From Main Reservoir to Nursery Reservoir					
	Initial Water Filling	Unit	159	3.85	614	
	Water Exchange (80% 2 times per day)	Unit	15,300	3.85	59,000	

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
5.2	Pumping Cost - From Sea to Main Reservoir					
	Initial Water Filling	Unit	64	3.85	245	
	Water Exchange (80% 2 times per day)	Unit	6,120	3.85	23,600	
5.4	Blower operation	Unit	10,800	3.85	41,600	
5.5	Lighting & Domestic	Unit	5,370	3.85	20,700	
5.6	Freshwater Pumping	Unit	68	3.85	300	
5.7	UWTP Pumping	Unit	90	3.85	400	
6.0	**Over Heads Expenditures**					
6.1	Salaries and wages (per crop cycle of 2 month)					
a)	Accountant/ Administrative Staff - 1Nos	Days	30	833	25,000	
b)	Technical Assistant - 1Nos	Days	60	1,000	60,000	2.75%
c)	Workers - 2Nos	Days	120	583	70,000	
6.2	Harvesting & Marketing expenditure	LS	1	10,000	10,000	
6.3	Furnitures & Other Consumables	LS	1	30,000	30,000	
6.4	Fuel & Vehicle Maintenance	LS	1	5,000	5,000	1.07%
6.5	Medical & insurance	Nos	1	5,000	5,000	
6.6	Sundry expenses - 5% of above	Percent	1	5	10,250	
7.0	**LEASE COST**					
7.1	Lease Cost of the facility per cycle	Percent	1	2,82,30,916	2,35,258	4%
7.2	Depreciation per cycle	LS	1	1,19,007	1,19,007	2%
	Total Operational Cost per Cycle				**56,40,990**	**100.0%**

5.2.2. Operational Cost Estimates for Fish Nursery – Unit 2

The planned size of production of Seabass in Nursery is 20gm fish for six cycle per year in 16 numbers of 17 m3 indoor and 36 m3 of 16 number outdoor tank for the production.

Table 5.4: Operation Cost for Fish Nursery – Unit 2

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Tank Preparation (Cleaning, Disinfection and filling)**					
1.1	Nursery Indoor System	Mandays	5	1,000	5,000	0.21%
1.2	Nursery Outdoor System	Mandays	5	1,000	5,000	
2.0	**Fry Cost**					
2.1	Nursery - Indoor system	Nos	4,06,944	7.5	30,52,100	65%
2.2	Nursery - Outdoor system (Transferred from Indoor)			No cost		
3.0	**Feed Cost**					
3.1	Nursery Indoor system	Kg	1,172	150	1,75,800	19.38%
3.2	Artificial feed attractant	LS	1	20,000	20,000	
3.3	Nursery Outdoor system	Kg	6,511	110	7,16,300	
4.0	**Chemical & probiotic cost**					
4.1	Probiotics	Kg	10	5,000	50,000	1%
5.0	**Power Cost**					
5.1	Pumping Cost - From Nursery Reservoir to Tanks					4.22%
a)	Initial Water Filling	Unit	191	3.85	736	
b)	Water Exchange (80% 2 times per day)	Unit	18,360	3.85	70,700	
5.2	Pumping Cost - From Main Reservoir to Nursery Reservoir					
a)	Initial Water Filling	Unit	159	3.85	614	
b)	Water Exchange (80% 2 times per day)	Unit	15,300	3.85	59,000	
5.2	Pumping Cost - From Sea to Main Reservoir					
a)	Initial Water Filling	Unit	64	3.85	245	

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
b)	Water Exchange (80% 2 times per day)	Unit	6,120	3.85	23,600	
5.3	Blower operation		10,800	3.85	41,600	
5.4	Lighting & Domestic	Unit	492	3.85	1,900	
5.5	UWTP Pumping	Unit	90	3.85	400	
6.0	**Over Heads Expenditures**					
6.1	Salaries and wages (per crop cycle of 2 month)					
b)	Accountant/ Administrative Staff - 1Nos	Days	30	833	25,000	
c)	Technical Assistant - 1Nos	Days	60	1,000	60,000	3.29%
c)	Workers - 2Nos	Days	120	583	70,000	
6.2	Harvesting & Marketing expenditure	LS	1	10,000	10,000	
6.3	Furnitures & Other Consumables	LS	1	30,000	30,000	
6.4	Fuel & Vehicle Maintenance	LS	1	5,000	5,000	1.28%
6.5	Medical & insurance	Nos	1	5,000	5,000	
6.6	Sundry expenses- 5% of above	Percent	1	5	10,250	
7.0	**LEASE COST**					
7.1	Lease Cost of the facility per cycle	Percent	1	2,10,22,376	1,75,186	4%
7.2	Depreciation per cycle	LS	1	91,975	91,975	2%
	Total Operational Cost per Cycle				**47,05,407**	**100.0%**

5.2.3. Operational Cost Estimates for Fish Growout

The planned size of production of Seabass in Growout is 750gm fish for two cycle per year in 8 numbers of 0.1Ha pond for the production.

Table 5.5: Operation Cost for Fish Growout

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Pond Preparation (Cleaning, Disinfection and filling)**					
1.1	Growout Pond Preparation	Mandays	10	1,000	10,000	0.11%
2.0	**Seed Cost**					
2.1	Cost of 20gm of fish	Nos	48,235	35	16,88,300	19.36%
3.0	**Feed Cost**					
3.1	Feed	Kg	43,412	110	47,75,400	54.77%
4.0	**Chemical & probiotic cost**					
4.1	Probiotics	LS	1	20,000	20,000	0.23%
5.0	**Power Cost**					
5.1	Pumping Cost - From Reservoir to Pond					7.54%
a)	Initial Water Filling	Unit	201	3.85	800	
b)	Water Exchange (60% per day)	Unit	21,706	3.85	83,600	
5.2	Pumping Cost - From Sea to Pond					
a)	Initial Water Filling	Unit	151	3.85	600	
b)	Water Exchange (60% per day)	Unit	16,279	3.85	62,700	
5.3	Aeration Equipment	Unit	1,16,640	3.85	4,49,100	
5.4	Lighting & Domestic	Unit	15,840	3.85	61,000	
6.0	**Over Heads Expenditures**					
6.1	Salaries and wages (per crop cycle of 6 month)					
a)	Technical Supervisor - 1Nos	Month	6	30,000	1,80,000	6.19%
b)	Accountant/ Administrative Staff - 1Nos	Month	6	25,000	1,50,000	
c)	Workers - 2Nos	Month	12	17,500	2,10,000	

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
6.2	Furnitures & Other Consumables	LS	1	50,000	50,000	1.33%
6.3	Fuel & Vehicle Maintenance	LS	6	5,000	30,000	
6.4	Medical & insurance	Nos	1	5,000	5,000	
6.5	Sundry expenses - 5% of above	Percent	1	5	31,250	
7.0	**LEASE COST**					
7.1	Lease Cost of the facility per cycle	Percent	2.5	2,41,86,443	6,04,661	7%
7.2	Depreciation per cycle	LS	1	3,06,014	3,06,014	4%
	Total Operational Cost per Cycle				**87,18,425**	100.00%

5.2.4. Operational Cost Estimates for Crab Growout

The planned size of production of Crab in Growout is 500gm fish for two cycle per year in 8 numbers of 0.1Ha pond for production.

Table 5.6: Operation Cost for Crab Growout

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Pond Preparation (Cleaning, Disinfection and filling)**					
1.1	Hapa for Crab (based 8 cycle lifetime)	Prorata	30	5,000	1,50,000	5.91%
1.2	Crab fencing (based 8 cycle lifetime)	Prorata	160	100	16,000	
1.3	Growout Pond Preparation	Mandays	10	1,000	10,000	
1.4	Hideouts (based 8 cycle lifetime)	LS	1	1,00,000	1,00,000	
2.0	**Crablet Cost**					
2.1	Cost of 10gm crablets	Nos	24,117	25	6,03,000	12.92%
3.0	**Feed Cost**					
3.2	Wet Feed (Grinded trash fish & Clams)	Kg	57,882	35	20,25,900	43.41%
4.0	**Chemical & probiotic cost**					
4.1	Algae developing chemicals	LS	1	15,000	15,000	0.64%
4.2	Lime - Ph adjustment	LS	1	15,000	15,000	

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
5.0	**Power Cost**					
5.1	Pumping Cost - From Reservoir to Pond					13.57%
	Initial Water Filling	Unit	151	3.85	600	
	Water Exchange (50% 2 time a day)	Unit	27,132	3.85	1,04,500	
	Pumping Cost - From Sea to Reservoir					
	Initial Water Filling	Unit	113	3.85	500	
	Water Exchange (50% 2 time a day)	Unit	20,349	3.85	78,400	
5.3	Aerator	Unit	1,16,640	3.85	4,49,100	
6.0	**Over Heads Expenditures**					
6.1	Salaries and wages (per crop cycle of 6 month)					
a)	Technical Supervisor - 1Nos	Month	6	30,000	1,80,000	11.57%
b)	Accountant/ Administrative Staff - 1Nos	Month	6	25,000	1,50,000	
c)	Workers - 2Nos	Month	12	17,500	2,10,000	
6.2	Furnitures & Other Consumables	LS	1	50,000	50,000	2.04%
6.3	Fuel & Vehicle Maintenance	LS	1	10,000	10,000	
6.4	Medical & insurance	Nos	1	5,000	5,000	
6.5	Sundry expenses - 5% of above	Percent	1	5	30,250	
7.0	**LEASE COST**					
7.1	Lease Cost of the facility per cycle	Percent	3	1,18,54,735	2,96,368	6%
7.2	Depreciation per cycle	LS	1	1,67,282	1,67,282	4%
	Total Operational Cost per Cycle				**46,66,900**	100.00%

5.2.5. Operational Cost Estimates for Water Management System

Project smooth operation depends upon the water management system like pump house, water intake system, beach borewell systems

Table 5.7: Operation Cost for Water Management System

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Power Cost**					
1.3	Pump House - Ligthing	Unit	366	3.85	1,500	0.03%
2.0	**Over heads expenditures**					
2.1	Salaries and wages					
a	Technical Assistant - 1Nos	Month	12	30,000	3,60,000	24.75%
b	Accountant/ Adminstrative Staff - 1Nos	Month	12	25,000	3,00,000	
c	Workers - 2Nos (Pump Operators)	Month	24	17,500	4,20,000	
2.2	Utilities & Other Consumables	LS	12	10,000	1,20,000	5.57%
2.3	Medical & insurance	Nos	12	5,000	60,000	
2.4	Sundry expenses - 5% of above	Percent	1	5	63,000	
3.0	**LEASE COST**					
3.1	Lease Cost of the facility per Year	Percent	**5**	3,47,42,211	17,37,111	39.81%
3.2	Depreciation per year	LS	**1**	13,01,586	13,01,586	29.83%
	Total Operational Cost per Year				**43,63,196**	100.00%

5.2.6. Operational Cost Estimates for Civil External Works

Civil External works consist of road networks, rainwater harvesting, crossing culverts

Table 5.8: Operation Cost for Civil External Works

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Over heads expenditures**					
1.1	Salaries and wages					
a)	Facility Manager - 1Nos	Month	12	1,00,000	12,00,000	49.68%
b)	Technical Assistant - 1Nos	Month	12	25,000	3,00,000	
c)	Workers - 1Nos	Month	12	17,500	2,10,000	
1.2	Utilities & Other Consumables	LS	12	10,000	1,20,000	7.98%
1.3	Medical & insurance	Nos	12	5,000	60,000	
1.4	Sundry expenses - 5% of above	Percent	1	5	94,500	
2.0	**LEASE COST**					
2.1	Lease Cost of the facility per Year	Percent	5	2,01,01,449	10,05,072	29.20%
2.2	Depreciation per year	LS	1	4,52,283	4,52,283	13.14%
	Total Operational Cost per Year				**34,41,855**	100.00%

5.2.7. OPERATIONAL COST ESTIMATES FOR INFRASTRUCTURE FOR ELECTRIFICATION

Table 5.9: Operation Cost for Infrastructure for Electrification

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Power Cost**					
1.1	Electricity for MV Panel Room	Unit	48,180	3.85	1,85,500	13.69%
1.1	Electricity for Operating Street Lights - (1Unit 16.5Kw working for 8hrs per annum)	Unit	48,180	3.85	1,85,500	
2.0	**Over heads expenditures**					
2.1	Salaries and wages					
c)	Technical Assistant - 1Nos	Month	12	25,000	3,00,000	18.82%

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
e)	Workers - 1Nos	Month	12	17,500	2,10,000	
2.2	Utilities & Other Consumables	LS	12	10,000	1,20,000	13.96%
2.3	Medical & insurance	Nos	12	18,000	2,16,000	
2.4	Sundry expenses	Percent	1	5	42,300	
3.0	**LEASE COST**					
3.1	Lease Cost of the facility per Year	Percent	5	1,99,98,338	9,99,917	36.91%
3.2	Depreciation per year	LS	1	4,49,963	4,49,963	16.61%
	Total Operational Cost per Year				**27,09,180**	100.00%

5.2.8. Operational Cost Estimates for ETP And Water Body Angling

Table 5.10: Operation Cost for Infrastructure for Electrification

S. No.	Description	Unit	Quantity	Cost / Unit (Rs.)	Amount (Rs.)	Percentage (%)
1.0	**Power Cost**					
1.1	Electricity for Operating ETP Pump - (1 Units 16.5Kw working for 8hrs per day for 1 year)	Unit	48,180	3.85	1,85,500	13.89%
2.0	**Over heads expenditures**					
2.1	Salaries and wages					
a)	Workers - 1Nos (ETP Pump Operator)	Month	12	17,500	2,10,000	15.73%
2.2	Utilities & Other Consumables	LS	12	10,000	1,20,000	27.21%
2.3	Medical & insurance	Nos	12	18,000	2,16,000	
2.4	Sundry expenses	Percent	1	5	27,300	
3.0	**LEASE COST**					
3.1	Lease Cost of the facility per Year	Percent	5	31,27,520	1,56,376	11.71%
3.2	Depreciation per year	LS	1	4,20,093	4,20,093	31.46%
	Total Operational Cost per Year				**13,35,269**	100.00%

5.3. Lease Calculation

5.3.1. Lease Rate

The lease rate for the facility has been calculated based on different parameter such as the annual depreciation of the building, statutory annual taxes to be paid, interest on the capital investment payable to the banker/ interest on the fixed deposit payable by the banker if the construction cost has been deposited in the bank instead of construction.

5.3.2. Depreciation Rate

As per the income tax guideline for immovable property, straight line method of depreciation has been considered with 10% salvage value and life period of the building as per annexure 7, clause 3(A) for RCC building at 60 years, and for industrial truss roof class A type building as 40 years.

The project has admin building as RCC buildings & other buildings as truss building.

Depreciation calculated for equipment & pump with a depreciation period of 15 years for equipment and 5 years for pump

Table 5.11: Depreciation Calculation of RCC Building

A. Depreciation Calculation for RCC Buildings							
S.No	**Building**	**Infrastructure Development Cost**	**Life Period**	**Salvage Percentage**	**Salvage Value**	**Depreciation**	**Annual Depreciation**
A	**B**	**C**	**D**	**E**	**F=CxE**	**G=C-F**	**H=G/D**
1	Admin Building	2,55,64,922	60	10%	25,56,492	2,30,08,429	3,83,474
						Total	**3,83,474**

Table 5.12: Depreciation Calculation for Non RCC Buildings

S.No	Building	Infrastructure Development Cost	Life Period	Salvage Percentage	Salvage Value	Depreciation	Annual Depreciation
A	B	C	D	E	F=CxE	G=C-F	H=G/D
1	Nursery Complex for Fish - Unit 1 (including Nursery area, reservoir, treatment cum blower cum panel room, used water treatment plant, office &staff accommodation, Freshwater tank, Septic Tank, overhead tank)	2,72,80,840	40	10%	27,28,084	2,45,52,756	6,13,819
2	Nursery Complex for Fish - Unit 2 (including Nursery area, reservoir, treatment cum blower cum panel room, used water treatment plant)	2,00,72,300	40	10%	20,07,230	1,80,65,070	4,51,627
3	Growout Ponds -Block A (consisting of lined ponds, Office and staff accommodation, panel cum blower room, freshwater tank platform, septic tank)	2,26,50,608	40	10%	22,65,061	2,03,85,547	5,09,639
4	Growout Ponds -Block B	1,03,18,900	40	10%	10,31,890	92,87,010	2,32,175
5	Water Management System						
5.1	Sea Water Intake System (consisting of Intake line, pump house and mainwater supply line)	1,23,25,543	40	10%	12,32,554	1,10,92,989	2,77,325
5.2	Reservoir System (consisting of Reservoir Ponds, Dissipation Box with Filtration System, Feeder Canals with Inlets, Sump for pumping)	1,40,39,224	40	10%	14,03,922	1,26,35,301	3,15,883
5.3	Raw Water Circular Reservoir	53,40,306	40	10%	5,34,031	48,06,276	1,20,157

S.No	Building	Infrastructure Development Cost	Life Period	Salvage Percentage	Salvage Value	Depreciation	Annual Depreciation
6	Developmental Civil External Works (including, Roads Process Water Drainage system and rainwater Drainage system including culverts)	2,01,01,449	40	10%	20,10,145	1,80,91,304	4,52,283
7	Infrastructure for Electrification (consisting of Street Light, Main Consumer EB yard, Pipe System for HT Cable, Transformer YARD, MV Panel room, Generator Bed)	1,99,98,338	40	10%	19,99,834	1,79,98,505	4,49,963
8	ETP and Water Body for Angling	11,57,248	40	10%	1,15,725	10,41,523	26,038
Total							**34,48,907**

Table 5.13: Depreciation Calculation for Equipment

C. Depreciation Calculation for Equipment				
S. No	**Building**	**Equipment Cost**	**Life Period**	**Annual Depreciation**
A	**B**	**C**	**D**	**E=C/D**
1	Nursery Complex for Fish - Unit 1	6,73,421	15	44,895
2	Nursery Complex for Fish - Unit 2	6,73,421	15	44,895
3	Growout Ponds - Block A	15,35,835	15	1,02,389
4	Growout Ponds - Block B	15,35,835	15	1,02,389
5	Raw Water Circular Reservoir	1,44,046	15	9,083
Total				**3,04,171**

Table 5.14: Depreciation Calculation for Pumps

D. Depreciation Calculation for Pumps				
S.No	**Building**	**Pump Cost**	**Life Period**	**Annual Depreciation**
A	**B**	**C**	**D**	**E=C/D**
1	Nursery Complex for Fish - Unit 1	2,76,654	5	55,331
2	Nursery Complex for Fish - Unit 2	2,76,654	5	55,331
3	Sea Water Intake System	13,08,292	5	2,61,658
4	Reservoir System	13,08,292	5	2,61,658
5	Raw Water Circular Reservoir	2,76,508	5	55,302
6	ETP and Water Body for Angling	19,70,273	5	3,95,055
Total				**10,83,335**

5.3.3. Interest Rate

The amount of CAPEX which otherwise if invested in a fixed deposit would bring in a revenue at the current interest rate of 5% which work to **Rs.1,07,07,300** of CAPEX. This amount has to realised from the lessee in addition to the depreciation.

Table 5.15: Interest Calculation

S. No.	Description	Unit	Quantity	Percentage	Amount (Rs.)
1.0	**Interest Rate**				
1.1	Interest rate @ of 5% from capitalized expenditure	Unit	21,41,45,027	5.00%	1,07,07,300

Table 5.16: Total Lease Calculation

F. Lease Calculation		
S. No	**Description**	**Amount (Rs.)**
1	Depreciation Amount	52,19,886
2	Interest Amount	1,07,07,300
	Grand Total	**1,59,27,186**

Thus, the total Lease Amount is approx. **Rs 1,60,00,000 (Rupees One Crore Sixty Lakhs)**

5.4.Cost Summary

Table 5.17: Abstract of Operating Cost

S. No.	Components of Aqua Park	Capital Cost (A)	Direct Operating Cost (B)	Total Production infrastructure OPEX (C)	Percentage in total Production infrastructure OPEX (D = B/C)	Indirect Operating Cost (E)	Total Operating Cost (F=B+E)
1	**Nursery Complex for Fish Unit 1**			8,88,49,036			
1.1	Indoor Nursery	2,82,30,916	3,38,45,942		38%	56,29,125	3,94,75,067
1.2	Outdoor Nursery						
2	**Nursery Complex for Fish Unit 2**						
2.1	Indoor Nursery	2,10,22,376	2,82,32,443		32%	49,95,510	3,29,27,953
2.2	Outdoor Nursery						
3	**Growout Ponds - for Fish**	2,41,86,443	1,74,36,850		20%	29,00,029	2,03,36,876
4	**Growout Ponds - for Crab**	1,18,54,735	93,33,801		11%	15,52,361	1,08,86,162
5	**Water Management System**			1,47,77,025	The cumulative direct operating cost of general infrastructure form	-	-
5.1	Sea Water Intake System	1,36,33,835	43,63,196				

S. No.	Components of Aqua Park	Capital Cost (A)	Direct Operating Cost (B)	Total Production infrastructure OPEX (C)	Percentage in total Production infrastructure OPEX (D = B/C)	Indirect Operating Cost (E)	Total Operating Cost (F=B+E)
5.2	Reservoir System	1,53,47,515			item no 5 to 10 which is Rs.1,47,77,025 will be re appropriated as indirect operating cost to the production units 1 to 4 based on their percentage influence on the cumulative direct operating cost for the item no 1 to 4		
5.3	Raw Water Circular Reservoir	57,60,861					
6	**Development of Civil External Works**	2,01,01,449	34,41,855				
7	**Infrastructure for Electrification**	1,99,98,338	27,09,180				
8	**ETP and Water Body for Angling**	31,27,520	13,35,269				
9	**Admin Building**	2,55,64,922	16,61,720				
10	**Preliminary Project Cost (Capitalized)**	2,53,16,118	12,65,806				
	Total Amount	**21,41,45,027**	**10,36,26,062**				

Table 5.18: Revenue pattern

The revenue for the project will be generated through sale of different outputs from the production units and the lease of land and as appropriate. Different streams of fund generation are as below

S. No.	Components of Aqua Park	Capacity per Cycle	Cost of Production per Unit	Unit	Mode of Revenue	Revenue per Year	Profit per Year
1	**Nursery Complex for Fish Unit 1**						
1.1	Indoor Nursery	3,25,555	-	-	-	**-**	
1.2	Outdoor Nursery	2,60,444	25.26	Per 20gm Fish	sale of 20gm fish @ 35 per fish	**5,46,93,274**	**1,52,18,206**
2	**Nursery Complex for Fish Unit 2**						
2.1	Indoor Nursery	3,25,555	-	-	-	**-**	
2.2	Outdoor Nursery	2,60,444	21.07	per 20gm Fish	sale of 20gm fish @ 35 per fish	**5,46,93,274**	**2,17,65,321**
3	**Growout Ponds -Block A - for Fish**	38,588	263.51	per 750gm Fish	sale of 750gm fish @ 325 per fish	**2,50,82,054**	**47,45,176**
4	**Growout Ponds -Block B - for Crab**	19,294	282.11	per 500gm Crab	Sale of 500gm crab @350 per crab	**1,35,05,722**	**26,19,559**

S. No.	Components of Aqua Park	Capacity per Cycle	Cost of Production per Unit	Unit	Mode of Revenue	Revenue per Year	Profit per Year
5	**Water Management System**	-	-	-	-	**0**	**0**
5.1	Sea Water Intake System						
5.2	Reservoir System						
5.3	Raw Water Circular Reservoir						
6	**Development of Civil External Works**						
7	**Infrastructure for Electrification**						
8	**ETP and Water Body for Angling**						
9	**Admin Building**						
10	**Preliminary Project Cost (Capitalized)**						
	Total Amount					**14,79,74,323**	**4,43,48,262**

As per the estimates made, the estimated operational cost to run the project per year would be **Rs.14.79 crores** and expected profitability on operation could be **Rs.4.43 crores.**

5.5.Staffing Pattern

Human resource is the most important asset of a project. The planning of manpower ensures adequate supply, proper quality and quantity as well as effective utilization. Manpower planning is the process by which management determines how an organization should move from its current manpower position to its desired manpower positions through planning, management, strives to have the right place at the right time to do the things that in both the organization and the individual getting long time benefits.

Table 5.19: Staffing pattern

<table>
<tr><th>S. No.</th><th>Working Department</th><th>Facility Manager</th><th>Technical Assistant / Technician</th><th>Accountant / Administrative Staff</th><th>Workers</th><th>Total Manpower Building Wise</th></tr>
<tr><td>1</td><td>Fish Nursery Unit</td><td rowspan="8">1</td><td>1</td><td rowspan="2">1</td><td>2</td><td>4</td></tr>
<tr><td>2</td><td>Fish Nursery Unit</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>3</td><td>Fish Growout Unit</td><td>1</td><td>1</td><td>2</td><td>4</td></tr>
<tr><td>4</td><td>Crab Growout Unit</td><td>1</td><td>1</td><td>2</td><td>4</td></tr>
<tr><td>5</td><td>Water Management System</td><td>1</td><td rowspan="4">1</td><td>2</td><td>5</td></tr>
<tr><td>6</td><td>External Infrastructure</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td>7</td><td>General Electrification</td><td rowspan="2">1</td><td>1</td><td>2</td></tr>
<tr><td>8</td><td>ETP</td><td>1</td><td>1</td></tr>
<tr><td></td><td>Total</td><td>1</td><td>7</td><td>4</td><td>13</td><td>25</td></tr>
</table>

6. Equipment & Machinery

The Following table indicates the Equipment and machinery installed in the project for various operations like pumping, filtration, aeration, etc.

Table 6.1 Equipment List

S. No	Description	Make	Unit	Quantity
1.	ISI marked mono block pump set capable of delivering Sea water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 3 phase AC supply as required. Horizontal centrifugal end suction Pump, 3Phase, 200m³/hr, 20m Head, Material of Construction Stainless Steel 316 - Shaft, Impeller, Casing. Shaft Seal type -Mechanical Seal, Pump Body-Nickel Cast Iron for Sea Water intake	Lubi, Model: LBSS 125-250, 20 hp, 150 mm x 125 mm, MOC SS316	Nos	4
2.	Sand filter, spherical in shape made of Fibre reinforced Plastic (FRP) with UV resistant surface finish and internal surface of the tank is finished with water resistant resin with top mounted multiport valve with complete all accessories as required for Raw water circular Reservoir	Emaux, Top mount filter, 2.0" valve, 20m³/hr capacity filter	Nos	2
3.	Sand filter media	-	Kgs	500
4.	Activated carbon filter, spherical in shape made of Fibre reinforced Plastic (FRP) with UV resistant surface finish and internal surface of the tank is finished with water resistant resin with top mounted multiport valve with complete all accessories as required for Raw Water circular Reservoir	Emaux, Top mount filter, 2.0" valve, 20m³/hr capacity filter	Nos	2
5.	Activated carbon filter media	-	Kgs	500
6.	Mono block pump set capable of delivering Sea water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 3 phase AC supply as required. centrifugal Pump, 20m³/hr, 3Phase, 25m Head, Material of Construction Material of Construction Stainless Steel 316 - Shaft, Impeller, Casing. Shaft Seal	Lubi, Model: LBS 40-125, 5 hp, 65 mm x 40 mm, MOC SS316	Nos	2

S. No	Description	Make	Unit	Quantity
	type -Mechanical Seal, Pump Body-Nickel Cast Iron for Raw Water circular Reservoir			
7.	Mono block pump set capable of delivering Sea water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 3 phase AC supply as required. centrifugal Pump, 150m³/hr, 3Phase, 20m Head, Material of Construction Stainless Steel 316 - Shaft, Impeller, Casing. Shaft Seal type -Mechanical Seal, Pump Body-Nickel Cast Iron for Reservoir pond	Lubi, Model: LBSS 125-250, 20 hp, 150 mm x 125 mm, MOC SS316	Nos	4
8.	Regenerative blower set capable of Airflow 800m³/hr, Outlet pressure 570 Mbar, Inlet pressure -360 Mbar, direct diver, single stage operated on 415 volts, 50 Hz, 3 phase AC supply as required. 3Phase, 10HP, 800m³/hr air flow and 2880 RPM Regenerative Blower for Outdoor Nursery for Fish	Cleantek, Model:10A, 10HP Regenerative blower at 800m³/hr air flow	Nos	2
9.	Mono block pump set capable of delivering Sea water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 3 phase AC supply as required. centrifugal Pump, 10m³/hr, 3Phase, 20m Head, Material of Construction Stainless Steel 316 - Shaft, Impeller, Casing. Shaft Seal type -Mechanical Seal, Pump Body-Nickel Cast Iron for outdoor Nursery Treatment Room for Fish	Lubi, Model: LBS 32-125, 3 hp, 50 mm x 32 mm, MOC SS316	Nos	2
10.	6" filter Diameter, 29" height Bag housing made of polypropylene, inner basket made of polypropylene as required. Bag Housing with Inner basket, Pressure Gauge with NPT adaptor, Plastic leg for housing for outdoor Nursery Treatment Room for Fish	FSI, Model: X100	Nos	4
11.	Polypropylene bag filter 6" diameter, 20"length as required.10µm filter Bag for outdoor Nursery Treatment Room for Fish	FSI, Model: X01	Nos	50
12.	Polypropylene bag filter 6" diameter, 20"length as required.5µm filter Bag for outdoor Nursery Treatment Room	FSI, Model: X01	Nos	50
13.	20m³/hr capacity, 125 PSI, 155 watts 2 UV lamps, Inlet & Outlet size of 2". Making of UV	Hitech Ultraviolet Pvt Ltd,	Nos	1

S. No	Description	Make	Unit	Quantity
	radiator at SS 316 and Control panel at SS 304 complete as required for outdoor Nursery Treatment Room for Fish	Model: GI 80HP, Max flow rate 2000LPH		
14.	Booster pump set capable of delivering fresh water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 1 phase AC supply as required. centrifugal Pump, 10m³/hr, 3Phase, 6m Head, Material of Construction Stainless Steel 416 - Shaft, Cast Iron-Impeller, Casing. Shaft Seal type - Mechanical Seal, Pump Body-Nickel Cast Iron for outdoor Nursery Fresh water sump for Fish	Lubi, Model: LBI 1A, 2 hp, 50 mm x 50 mm, MOC SS410	Nos	1
15.	Regenerative blower set capable of Airflow 800m³/hr, Outlet pressure 570 Mbar, Inlet pressure -360 Mbar, direct diver, single stage operated on 415 volts, 50 Hz, 3 phase AC supply as required. 3Phase, 10HP, 800m³/hr air flow and 2880 RPM Regenerative Blower for Outdoor Nursery for Crab	Cleantech, Model:10A, 10HP Regenerative blower at 800m³/hr air flow	Nos	2
16.	Mono block pump set capable of delivering Sea water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 3 phase AC supply as required. Centrifugal Pump, 10m³/hr, 3Phase, 20m Head, Material of Construction Stainless Steel 316 - Shaft, Impeller, Casing. Shaft Seal type -Mechanical Seal, Pump Body-Nickel Cast Iron for outdoor Nursery Treatment Room for Crab	Lubi, Model: LBS 32-125, 3 hp, 50 mm x 32 mm, MOC SS316	Nos	2
17.	6" filter Diameter, 29" height Bag housing made of polypropylene, inner basket made of polypropylene as required. Bag Housing with Inner basket, Pressure Gauge with NPT adaptor, Plastic leg for housing for outdoor Nursery Treatment Room for Crab	FSI, Model: X100	Nos	4
18.	Polypropylene bag filter 6" diameter, 20"length as required.10µm filter Bag for outdoor Nursery Treatment Room for Crab	FSI, Model: X01	Nos	50
19.	Polypropylene bag filter 6" diameter, 20"length as required.5µm filter Bag for outdoor Nursery Treatment Room for Crab	FSI, Model: X01	Nos	50

S. No	Description	Make	Unit	Quantity
20.	20m³/hr capacity, 125 PSI, 155 watts 2 UV lamps, Inlet & Outlet size of 2". Making of UV radiator at SS 316 and Control panel at SS 304 complete as required for outdoor Nursery Treatment Room for Crab	Hitech Ultraviolet Pvt Ltd, Model: GI 80HP, Max flow rate 2000LPH	Nos	1
21.	Booster pump set capable of delivering fresh water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 1 phase AC supply as required. Centrifugal Pump, 10m³/hr, 3Phase, 6m Head, Material of Construction Stainless Steel 416 - Shaft, Cast Iron-Impeller, Casing. Shaft Seal type - Mechanical Seal, Pump Body-Nickel Cast Iron for outdoor Nursery Fresh water sump for Crab	Lubi, Model: LBI 1A, 2 hp, 50 mm x 50 mm, MOC SS410	Nos	1
22.	Aerator set with suitable 4 nos of paddle wheel and suitable motor operated on 415 volts, 50 Hz, 3 phase AC supply as required. 3Phase, 2HP, 4 Nos Paddle wheel Aerator for Growout ponds for Fish	Sagar	Nos	16
23.	Roots blower set capable of Airflow 1300m³/hr, 0.2 kg/cm², direct diver, single stage operated on 415 volts, 50 Hz, 3 phase AC supply as required for Growout ponds for Fish	TMVT, Model: 3MTL-150, 20HP Roots blower at 1300m³/hr air flow	Nos	2
24.	Aerator set with suitable 4 nos of paddle wheel and suitable motor operated on 415 volts, 50 Hz, 3 phase AC supply as required. 3Phase, 2HP, 4 Nos Paddle wheel Aerator for Growout ponds for Crab	Sagar	Nos	16
25.	Roots blower set capable of Airflow 1300m³/hr, 0.2 kg/cm², direct diver, single stage operated on 415 volts, 50 Hz, 3 phase AC supply as required for Growout ponds for Crab	TMVT, Model: 3MTL-150, 20HP Roots blower at 1300m³/hr air flow	Nos	2
26.	Submersible pump set capable of delivering water for following discharges and head (nominal), operated on 415 volts, 50 Hz, 3 phase AC supply as required. 20m³/hr, 3Phase, 10m Head, Material of Construction Stainless Steel 416 - Shaft, GCI-Impeller and Casing. Shaft Seal type -Mechanical Seal, Pump Body for ETP	Lubi, Model: LFP 3215F, 2 hp, 80 mm MOC SS410	Nos	2

7. SWOT Analysis

SWOT analysis is a method to assess a project's strengths, weaknesses, opportunities, and threats. It helps stakeholders identify which areas of a project to focus on as well as potential risks to address in advance.

S Strengths

- The site is well covered with water sources of brackish water at Northern part of the site, Mahendra Tanaya River
- The site has access to Sea water at eastern side of Bay of Bengal through a pumping station built up near the sea with one direct sea water intake system and one beach borewell system.
- The site has got an access to freshwater from southern side of the site. within the site currently there is borewell to supply the water requirement for all potable purpose.

W Weakness

- Intake system of sea water pumps being remote, may require additional cost on management potable purpose.
- Access road passing through village may have some limitations in future on the timings of transport
- water salinity in the sea may drop during high rains seasons due to Mahendra Tanaya river nearby

O Opportunities

- Additional area could be developed in phase 2 and phase 3 based on forward and backward linkages required for the phase 1 infrastructure effectiveness.
- Scaling up the production is possible by increasing the densities as all infrastructure of seawater, power is available in excess capacities
- Development of hatcheries in phase 2 would help in immediate availability of fry to nurseries and that will improve the returns
- Site being close to Orissa with good brackish water resources would help in the selling of seabass fry and fingerling in large quantities.
- Crablet, juvenile crab requirement is also high for the crab industry in Orissa and Andhra and so selling could be improved by using all the grow out facility for different sized crablets and juvenile Crabs.

T Threats

- Marketing could be affected in certain seasons which may affect the sales
- Sale price may change due to Market competition if any
- Cost price of fry to be purchased from the existing hatcheries could fluctuate and it may adversely affect the economics

8. Discussion and Conclusion

As per the workings done considering the inputs from the experts in the Industry globally, we can conclude that,

- Fingerling production of seabass is economically feasible and in the two-nursery facility created we can produce nearly **3.12 Million** nos at **20 gm,** creating a revenue of **Rs.10.93 Crores** and profitability of **Rs.3.70 Crores** in two nurseries per year.
- In Seabass growout we can produce nearly **77,000** nos at **750 gm** in growout creating a revenue **2.50 Crores** and profitability of **47.45 lakhs** in growout per year.
- In the case of Mud Crab growout we can produce nearly **38,500** nos at **500gm** creating a revenue of **Rs.1.35 Crores** and profitability of **Rs.26.20 Lakhs** per year.

The total revenue generated from the above facilities is **Rs.14.79 Crores** and the profitability is **Rs 4.43 Crores** per year.

Lease realisation by NFDB:

As the developer of the facility, NFDB will be realising the lease of their total development cost of **Rs.21.41 Crores** which works out to **Rs.1.60 Crores** per year. In **13.3** years of lease, they must be able to get the capital cost.

Thus, it is concluded that the project will go a long way in developing the aquaculture in the region. The project is technically and financially feasible for all the stake holders.

9. Annexure

9.1. Revised Preliminary Estimate (PE) as per CPWD

GENERAL ABSTRACT OF COST

Name of work: Development of Aquaculture Infrastructure for NFDB at Mulapolam, Srikakulam Dist. Andhra Pradesh.

Sl No.	Description	As per PE			As per Revised PE			Difference	Remarks
		Civil	Electrical	Total	Civil	Electrical	Total		
1	**Sea Water Intake System** (consisting of Intake line, pump house and main water supply line)	55,28,907	26,05,188	81,34,095	76,68,783	26,05,188	1,02,73,971	21,39,876	The revised Civil component (Annexure - I) is enclosed.
2	**Reservoir System** (consisting of Reservoir Ponds, Dissipation Box with Filtration System , Feeder Canals with Inlets, Sump for pumping)	99,02,629	20,22,150	1,19,24,779	99,02,629	20,22,150	1,19,24,779	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
3	**Primary Raw Water Circular Reservoir**	42,40,869	8,39,376	50,80,245	42,40,869	8,39,376	50,80,245	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
4	**Nursery Complex for Fish** (including Nursery area, reservoir, treatment cum blower cum panel room, used water treatment plant, office &staff accommodation, Freshwater tank, Septic Tank, overhead tank)	2,16,40,413	23,45,070	2,39,85,483	2,20,47,561	23,45,070	2,43,92,631	4,07,148	The revised Civil component (Annexure - II) is enclosed.
5	**Nursery Complex for Crab** (including Nursery area, reservoir, treatment cum blower cum panel room, used water treatment plant)	1,63,57,565	16,78,177	1,80,35,742	1,63,57,565	16,78,177	1,80,35,742	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
6	**GROW OUT PONDS -BLOCK A - for Fish** (consisting of lined ponds , Office and staff accommodation, panel cum blower room, freshwater tank platform, septic tank)	1,57,55,067	40,04,480	1,97,59,547	1,57,55,067	40,04,480	1,97,59,547	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
7	**GROW OUT PONDS -BLOCK B for Crab**	55,30,119	33,54,647	88,84,766	55,30,119	33,54,647	88,84,766	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
8	**Developmental External Works** (including, Roads Process Water Drainage system and rainwater Drainage system including culverts)	96,55,051		96,55,051	1,67,48,093		1,67,48,093	70,93,042	The revised Civil component (Annexure - III) is enclosed.
9	**Infrastructure for Electrification** (consisting of Main Consumer EB yard, Pipe System for HT Cable, Transformer YARD, MV Panel room ,Generator Bed)	31,79,631	1,10,39,734	1,42,19,365	31,79,631	1,10,39,734	1,42,19,365	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
10	**ETP and Water Body for Angling**	10,20,525	1,09,252	11,29,777	10,20,525	1,09,252	11,29,777	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
11	**Office Building**	1,88,82,192	36,62,368	2,25,44,560	1,88,82,192	36,62,368	2,25,44,560	0	The work is in progress , as per the scope of work in the original PE. So far, no deviations are arisen.
12	**Additional works (Civil)**				84,81,769		84,81,769	84,81,769	Additional works taken up as per the requirement of the Client department. (Annexure - IV)
13	**Additional works (Electrical)**					50,44,518	50,44,518	50,44,518	Additional works taken up as per the requirement of the Client department. (Annexure - V)
	TOTAL	11,16,92,968	3,16,60,442	14,33,53,410	12,98,14,803	3,67,04,960	16,65,19,763	2,31,66,353	
	Add 1% for Third Party Quality Control			14,33,534			16,65,198	2,31,664	
	TOTAL			14,47,86,944			16,81,84,960	2,33,98,016	
	Total Value of the RPE: Rs.16,81,84,976/- Expenditure incurred upto June - 2022 as per Form 65 issued Rs. 4,37,09,597/- The amount on which additional GST effect: 168184976 - 43709597 = Rs.12,44,75,379/- @6.33%						78,79,291	78,79,291	Add for increase in GST from 12% to 18% on all items - Multiplying factor 1.0633 (as per DG, CPWD, OM No. 158/ SE(TAS)/ GST/ 2022/ 331(H) dated 10.08.2022) for the work done after 18.07.2022
	TOTAL			14,47,86,944			17,60,64,251	3,12,77,307	
	ADD 3% FOR CONTINGENCIES			43,43,608			52,81,928	9,38,320	
	ADD 4.25% FOR EPF & ESIC			61,53,445			74,82,731	13,29,286	
	GRAND TOTAL			15,52,83,998			18,88,28,910	3,35,44,913	
	Say Rs.			15,52,84,000			18,88,29,000	3,35,45,000	

This Revised Preliminary Estimate amounting to Rs.18,88,29,000/- (Rupees Eighteen Crores Eighty Eight Lakhs Twenty Nine Thousand only) is submitted for obtaining necessary A/A & E/S from the competent authority.

9.2.Supporting Document for seabass weaned fry price

Finfish Seed Sales

Sl. No.	Species	Size (cm)	Cost per piece in Rs.	
			Seawater	Freshwater
1	Asian seabass	Fertilized eggs	0.25	NA
		Hatchlings (1-3 days)	0.30/-	NA
		Early larvae (up to 9 days from day 3)	0.55/-	NA
		0.5 - 0.9	3/-	NA
		1.0 - 1.4	4.75/-	5/-
		1.5 - 1.9	7.5/-	8.5/-
		2.0 - 2.4	9.5/-	10.5/-
		>2.5	9.5/- +3.5/cm	10.5/- + 3.5 /cm

Price list form https://ciba.icar.gov.in/

9.3.Supporting Document for Survival Percentage

BAFAC-2020, SURAT, GUJARAT

SATELLITE NURSERY FOR SEABASS FISH
AN INNOVATIVE APPROACH

Kaushik. A. H.
Mentor Scientists: Tanveer Hussain, M. Kailasam, P. K. Patil and G. Thiagarajan

Introduction

Karnataka, with a 320 km coastline is endowed with vast marine and brackish water resources in all the three of its coastal districts; Uttara Kannada, Udupi and Dakshina Kannada. Most of the rivers originating in the western ghats flow into the Arabian sea, forming huge estuarine areas. The estimated potential brackishwater area for aquaculture in Karnataka is about 8000 Ha of which more than 80% falls in the Uttara Kannada district. In recent years, most of the farmers diversified their farming system to cage culture of high value species like Asian Seabass due to high market demand and availability of seeds from CIBA and RGCA. More than 600 cages were registered for farming of Asian seabass in Karnataka.

Need of the innovative practice/ technology

As cage culture of Asian Seabass is gaining in popularity and increasing in the state, consistent and timely availability of appropriate stockable sized fingerlings for cage farming is the major constraint. A majority of the farmers depend on Andhra Pradesh for supply of wild seabass fingerlings or nursery reared (but not weaned to feed) fingerlings. These are not only expensive owing to its high transportation cost, but also do not accept artificial pellet feed as the fingerlings are not weaned. Therefore, farmers rely on feeding trash fish to the stocks during culture that increases the cost of production. To overcome this issue, it is necessary to produce and stock weaned/

Flow-through based Seabass Nursery System

advanced fingerlings in the grow-out system to ensure better growth and survival. A satellite "seabass nursery rearing technology" developed by ICAR-CIBA, came to the rescue of farmers as they now could obtain inputs spawn, larvae or fry from the CIBA breeding unit and operate the Seabass nursery on their own with technical assistance from CIBA.

The innovation

Under the guidance of CIBA scientists, young entrepreneurs from Kundapur taluk, Udupi district, Karnataka developed a tank-based flow through system to carry out nursery rearing of Asian seabass. This nursery system consists of 8 tanks (made up of HDPE

Seabass fingerling

sheet with GI pipe support) of 12-ton capacity each out of which 4 tanks were utilized for nursery rearing of fry and the rest for water storage. CIBA supplied around 38000 numbers of (16-25-day old, total length 0.5-0.8 cm) of hatchery reared seeds in 3 successive batches to these entrepreneurs to carry out nursery rearing.

In the first trial, 10,000 no's seeds of 0.5-0.8 cm were procured from CIBA @ Rs 2.5/fry and stocked in the 12-ton HDPE tanks @ 3000 nos./tank. It was reared for a period of 65 days by providing formulated feed @ 5-10 % of body weight daily. During this period, regular grading every four days, was practiced. Seabass fry attained fingerling size (7.5–10 cm) in 65 days of rearing with a survival rate of 60%. The fingerlings were sold to cage culture farmers of Kundapura @ Rs 45/piece and youths were able to generate substantial total income of Rs 2.7 lakhs through this exercise.

Sl.no	Date	Total seeds supplied from ICAR –CIBA (in batches)	Size of early fry stocked (16-25 day old)	Length of Seabass fingerlings (55-65 days)	Survival rate (%)	Revenue generated from Seabass fingerling sale
1.	23.10.19	10,000	0.5-0.8 cm	7.5-10 cm	60 %	Rs. 2,70,000
2.	06.12.19	10,000		7.5-10 cm	80 %	Rs.3,60,000
3.	25.12.19	18,000		7.5-10 cm	80 %	Rs. 6,48,000
Total		**38,000**				**Rs.12.78 Lakhs**

Summary of the three trials carried out by the entrepreneur