msam 2.0

Meghalaya State Aquaculture Mission
2018 - 2023

"from dependence to self sufficiency"

Department of Fisheries
Government of Meghalaya

Contents

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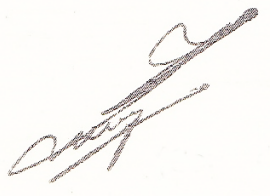
MESSAGE

I am happy to present the Meghalaya State Aquaculture Mission 2.0 document, for implementation between 2018 and 2023. The MSAM 1.0 implemented by the Government of Meghalaya during 2012-2017 has made a significant difference to the fisheries sector in the state. At least 10,000 M.T. of fish have been added to the state through this Mission and the landscape of the state is now dotted with small and moderately sized fish ponds, even in very remote areas of the state. While about 20,000 fish farmers have already been directly benefitted, work is going on in about five thousand ponds in the state which should soon be completed during the ensuing working season. At a very conservative estimate, the additional production of 10,000 M.T. will have resulted in a cash transfer of Rs. 120 crore to the farmers, if not more. That the MSAM 1.0 has made a permanent and sustainable impact on the quality of life in the rural areas, is self-evident, apart from the role it had played in conserving our most valuable natural resource of all – water.

The impact of the MSAM 1.0 has been both tangible in terms of the fish production and raised rural incomes and intangible in terms of the nutritional improvements, impounding of the otherwise run-off water. The work done during the MSAM 1.0 needs to be now consolidated. There are issues relating to the availability of the fingerlings of good quality, absence of high quality brooders, limited research capability of the department, and limited availability of feed. Each of these issues will now be addressed by the MSAM 2.0.

I am aware of the hard work that has gone into the implementation of the MSAM 1.0 and I compliment that Department of Fisheries for its phenomenal work of the past, and I hope the officers work with similar vigour in implementing the MSAM 2.0. The powerful slogan – *'from dependence to self-sufficiency'* did inspire the state, even as a state we have yet to become fully self-sufficient. It is always going to be work in progress. There is no such thing as finality in development work. The institutional capacity of the Department of Fisheries has gone up quite substantially and several bottlenecks had been overcome, through the MSAM 1.0. The Department was an otherwise an insignificant presence for a long period, but now has become a powerful and strong department, with an extra ordinary capacity to deliver, thanks to the MSAM 1.0. I want the officers to stay the course and be at it, till we shake off this highly avoidable dependency on other states. It is a matter of pride, as much as necessity that we keep working with greater conviction and commitment. I wish you all the very best in the implementation of the Meghalaya State Aquaculture Mission 2.0.



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MESSAGE

I am delighted to present the Meghalaya State Aquaculture Mission 2.0 document to the people of the State. The experience of the Department gained through the implementation of the MSAM 1.0 has helped us in preparing a document that is finely calibrated to the State's requirements over the next five years.

The Department of Fisheries has demonstrated its ability to implement the high impact Meghalaya State Aquaculture Mission during 2012-17. Though the MSAM 1.0 has broadly met its objectives, there are a few gaps that require to be bridged in the current Mission 2.0. The number of Hatcheries is still inadequate, there is a shortage of pelletized feed, the technical capability is hampered due to inadequate laboratory and training infrastructure, etc. All these issues will now be addressed through the MSAM 2.0. Even as a few of our serious concerns have been addressed in the previous Mission, the scope for bridging the gaps and making further improvements is always there, and I hope that the Department will continue to move with the same energy as it had shown earlier.

It will not be possible to find all the financial resources from the state plan for a Mission of this magnitude, so, it will be necessary to source funds and converge with other Schemes of the Government of India, viz., the Blue Revolution Scheme, and through the Externally Aided projects viz., through the KFW, CLLMP, etc. All efforts would be made to find the required resources to achieve the larger objective of moving from dependence to self-sufficiency. We may not be self-sufficient as yet, but an addition of 10000 M.T.s over a period of five years is no mean task either, given the historical neglect of the Fisheries sector in enhancing the GDP of the state and on my part, I will ensure that all support is rendered to the officials of the Department to achieve the objectives set before them and the goal to become self sufficient is realized soon enough.

Shri Coming One Ymbon

CHAPTER – I

An overview of MSAM 1.0

Background Note

Meghalaya State Aquaculture Mission (2012-17) was a bold step toward redefiningthe public service deliveryand inadopting a Mission mode approach. This five year Mission launched in 2012 with the slogan ***"from dependence to self-sufficiency"*** addressed a wide canvas,with 6 Mini Missions and well defined objectives.

Mini Mission I: Area and Productivity Expansion:

The primary objective of this Mini Mission was to create additional water area for aquaculture through Individual Ponds, Community Ponds, and Reclamation of Wetlands etc. The additional Aquaculture area created through 2500 hectares of individual ponds and community ponds resulted in an increase in the State's fish production from 4,799 MT in 2011-12 to 11, 961 MT by 2017-18, providing additional livelihoods to 25,000 fish farmers.

Mini Mission II: Critical Infrastructure Development

This Mini Mission was tasked with the aim of addressing the two very critical components of Aquaculture viz. fish seed feed production. This Mini Mission was designed to address the vicious cycle of low input and low productivity, by inducing infrastructure critical for the production of fish seed and fish feed in the State. 12 Eco-Hatcheries, 14 FRP Hatcheries, and 3 Fish Feed Mills were established in the private sector under this Mission. This resulted in an increase in the Fish seed Production from 3.268 Million in 2012-13 to 9.976 Million in 2017-18 which in turn, contributed largely to the Fish Production. All the fish feed mills are functional, though the requirement of fish feed is still very high in the state.

Mini Mission III: Conservation of Indigenous Fisheries Resources

There was a significant decline in fish population, especially of mahseer in our natural river systems, due to over fishing and unbridled exploitation of the natural resources. Meghalaya witnessed wanton killing of fishes through destructive methods like usage of dynamite, bleaching powder, pesticides, toxic herbs, electric current and others. Establishment of sanctuaries and conservation of indigenous and endemic species was the focus of Mini-Mission III. Fish conservation got an impetus with the launch of the Mission and through this Mini Mission, 54 Fish Sanctuaries have been established throughout the State. The outcome of this Mini Mission in restoring the natural fish population in rivers was significant. Through this Mini Mission we were able to witness strong community participation in villages, promotion of eco- tourism contributing to rural livelihoods, and a general awareness of sustainable management of resources.

Mini Mission IV: Capacity Building and Human Resource Development

This Mini Mission was the binding component that could ensure the successful implementation of other components of the Mission. Execution of tasks required strengthening of the capacities in skills and competencies of the fish farmers and departmental functionaries. Under this Mini Mission, the Meghalaya State Fisheries Research & Training Institute, Mawpun was established, equipped to build the capacities of the potential fish farmers and unemployed youth. Till date more than 5000 individuals have been trained by the institute. Several

Training Halls at the District level were also created in West Khasi Hills, Ri-Bhoi, East Garo Hills and West Garo Hills.

Mini Mission V: Mass Media Documentation and Outreach

The Proactive approach of the Mission required huge rapport building and attitudinal change among the community. In order to achieve the aims and objectives of the Mission, participation of the community in the developmental activities was essential. The Mini Mission V was the dedicated component to mobilise, create awareness through various Media (Campaigns, Workshops, Print and Electronic).

The annual State Aquafests have been a successful Platform for local farmers and urban consumers to connect. Establishment of Linkages between consumer and producers allowed foe the Mission to project its achievement and popularise the produce of the local farmers

Mini Mission VI: Emerging Opportunities in the Fisheries Sector

This Mini Mission was a visionary step of the department to tap new opportunities in the sector. These opportunities ranged from technology induction, introduction of new potential species, and promotion of innovative activities like Aqua Parks. Potential species like the GIFT Tilapia in collaboration with Marine Product Export Development Authority was taken up at the Meghalaya State Brood Bank at Umktieh, Ri-Bhoi. Under this Mission, 3 (three) Aqua-Parks at (i) Phot Ja-Ud, South West Khasi Hills (ii) Umtasor, Ri-Bhoi and (iii) Chenga Benga, South West Garo Hills have been established. A pilot project of Paddy –cum- Fish culture was taken up at Nonglwai Village, West Khasi Hills to demonstrate integrated fish farming. The programme has seen wide acceptance in the field and demonstrated a successful convergence between the Department of Fisheries and the Community & Rural Development Department.

Despite the gigantic and unprecedented efforts of the Meghalaya State Aquaculture Mission towards achieving self-sufficiency in fisheries sector, many areas critical to production processes of seed, feed and fish are still not to the optimal level. As such, import of fish, fish seed and fish feed from other states like Andhra Pradesh, West Bengal etc.is still prevalent. The reason for this being the increased fish consumption patterns and limited purchasing power of expensive local fish.

The following are the perceived gaps in the state fisheries sector:

The projected fish requirement in the State, taking into consideration the recommendation of the National Institute of Nutrition, Hyderabad @ Rs. 9 kg/per person/year is approximately 27,000 MT. With the current production in 2017-18 of 11,961 MT, the gap between demand and supply is 15,000 MT.

With the rise in aquaculture systems through Area and Productivity Expansion, demand for fish seed has considerably increased and the 24 hatcheries established under the Mission 1.0 are not able to meet this demand. There is a need for increasing fish seed and fish feed production to cater to the ever growing demand. A much more need based and location/region specific mode of implementation of such critical infrastructure is the need of the hour.

The Department of Fisheries hence sees the need to launch the second phase of the Meghalaya State Aquaculture Mission, MSAM 2.0 to address the gaps. The components from MSAM 1.0 which were most popular and which gained wide interest and demand have been taken into consideration for inclusion in MSAM 2.0. MSAM 2.0 would ensure that the projected targets of MSAM 1.0 are fulfilled. The areas of implementation of the Mission that require fine tuning and follow up would be addressed. A much more holistic approach ensuring demand driven projections and targets that are region specific would be taken up in this Mission.

Fish harvesting of Individual ponds

CHAPTER – II

Meghalaya State Aquaculture Mission 2.0

Introduction

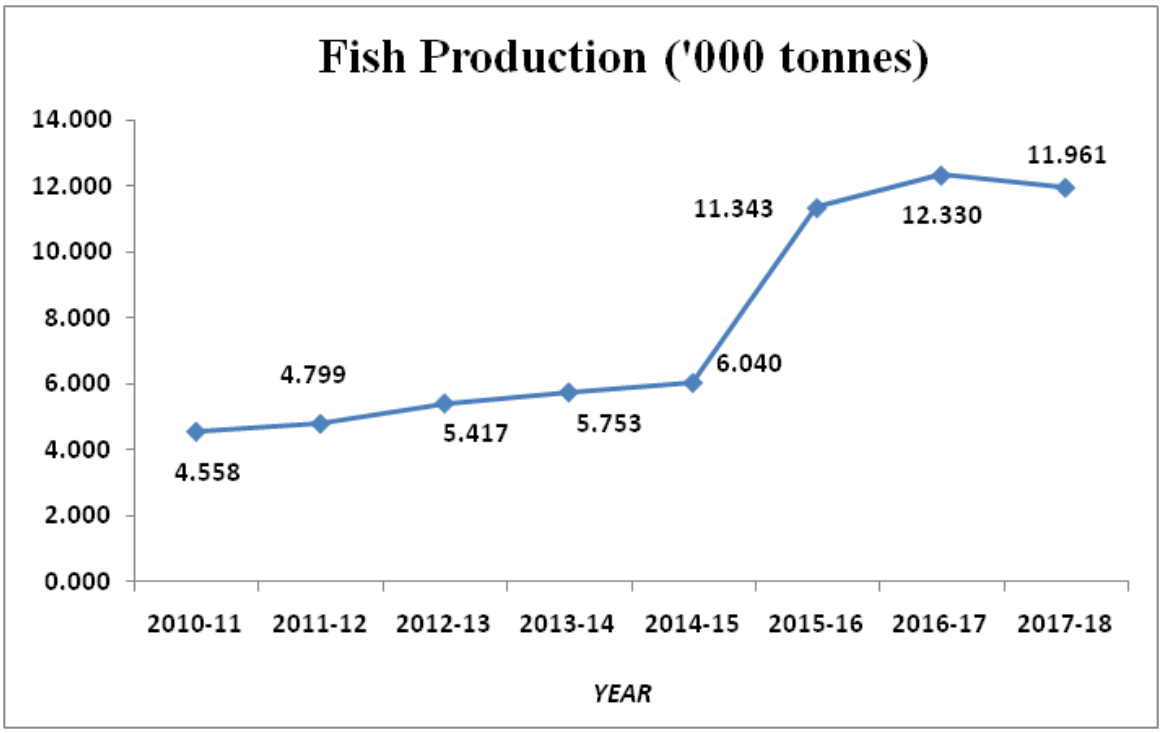
Fisheries and Aquaculture constitute a source of livelihood to millions of people all over the world. Faced with the challenges to cater to the ever growing demand of food to a population which is expected to reach 9 billion by the twenty first century, sustainable development goals are the need of the hour. In Meghalaya, Fisheries plays a very important role not only as a source of protein for human consumption but also in creating livelihoods to the farmers through various income generating activities right from fish culture, marketing and value chain management through ornamental and recreational fisheries, and tourism. Realizing the importance of Fisheries toward sustainable development, "Meghalaya State Aquaculture Mission' was launched in March 2012, to uplift the economy through fish farming, with the slogan "from dependence to self-sufficiency'.

With the implementation of the Meghalaya State Aquaculture Mission under Mini Mission-I, the Area and productivity expansion the production of fish has increased from 3,766 MT in 2007-08 to 11,961 MT in 2017-18 attributed to area expansion for fish culture covering an area of 1808.8 ha and generating livelihoods to 18,088 nos. of fish farmers brought under fishery farming system. The figure is expected to rise to 25,998 numbers by the end of 2018 as the mission is in the last year of implementation. In convergence with MNREGA, 61 (sixty one) community ponds were developed through this mission. The details of fish production are shown below in Table 1.

Table 1**: **Fish Production in ('000 Tonnes)

Year	Production
2010-11	4.558
2011-12	4.799
2012-13	5.417
2013-14	5.753
2014-15	6.040
2015-16	11.343
2016-17	12.330
2017-18	11.961

Fig: 1 Fish Production in thousand tonnes

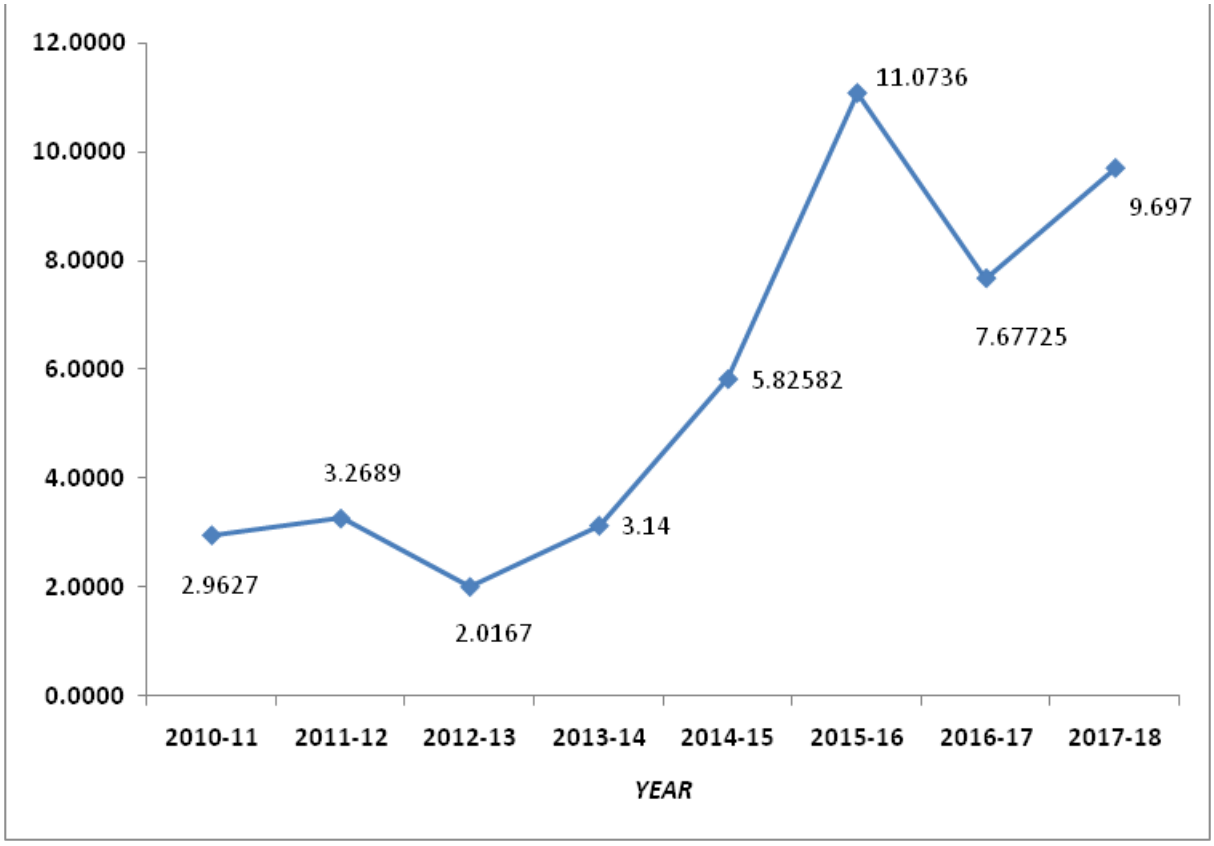


Although there has been a rapid increase in fish production over the past few years, there is still a gap of 15,000 MT as per the estimated requirement of 27,000 MT. In its effort to ensure supply of quality fish seed the Department has established 12 Eco Hatchery units and 14 FRP Hatcheries under the Mini Mission II which resulted in an increase of the production of fingerlings from 0.93 million in 2007-08 to 9.697 million in 2017-18. The details of the Fry and Fingerling production are shown in Table 2.

Table 2:Production of Fry and Fingerlings (In Millions)

Year	Production
2010-11	2.9627
2011-12	3.2689
2012-13	2.0167
2013-14	3.14
2014-15	5.82582
2015-16	11.0736
2016-17	7.67725
2017-18	9.697

Fig 2:Production of fry and fingerlings (In Millions)



The Department also seeks to achieve sustainable development of fish production to achieve Maximum sustainable Yield (MSY)through proper regulation of fishery resources by banning the catch of fish during the breeding season from the riverine ecosystem. Since over-exploitation leads to decrease in fish population including the stock of indigenous and endemic species, the establishment of sanctuaries for conservation of the aquatic fauna was encouraged through Mini Mission III to promote tourism, research, and academic studies in the state. A total of 54 sanctuaries were assisted by the department and entrusted to the community for proper management in line with the principles of ecological balance through mobilization and awareness campaign.

In addition to the above mentioned activities, capacity building played a significant role in building the human resources. Under Mini Mission IV of the MSAM, a total number of 5687 farmers were trained in scientific fish farming and its management practices at Meghalaya State Fisheries Research and Training Institute (MSFR&TI) at Mawpun in the Ri-Bhoi district. A total of 4 (four) Training Halls equipped with Hostel facilities were constructed in the Districts, to carry out various workshops and training programmes. Mass awareness and outreach programmes have been conducted through workshops, festivals and awareness campaigns. 6 (six) State level Aqua Fests have been organized till date providing the platform for the farmers to showcase their produce and enlightening the people to learn more about the success stories of the mission. The progressive fish farmers were also felicitated at various programmes to motivate other potential farmers to follow in their footsteps leading towards the overall development of the fisheries sector to tap the emerging opportunities in

Fisheries sector, 3 (three) nos. of Aqua-parks at i) Phot Ja-Ud, South West Khasi ii) Umatasor, Ri-Bhoi and iii) Chenga Benga, South Garo Hills respectively were created under the Mini Mission VI. A pilot project of paddy cum fish culture was taken up at Nonglwai village of West Khasi hills that successfully demonstrated integrated fish farming in convergence with the Community and Rural Development Department.

The Objectives MSAM 2.0are:

1. **Mini Mission 1 : Area and Productivity Expansion**

a. To increase the water area for fish production in the state through both individual and community ponds.
b. Maximum utilization of available resources for fish culture through integrated fish farming system such as paddy cum fish culture.
c. To raise the status of living of the farmers through income generating activities, and
d. Attainment of Maximum sustainable yield.

2. **Mini Mission II : Critical Infrastructure Development**

a. To increase the quality fish seed production in the state through the establishment of private hatcheries (Eco and FRP Hatcheries).
d. Promotion of quality fish feed production in the state through the establishment of feed mills, in the private sector.
c. To reduce the dependency of the import of feed and seed from neighbouring states.
d. Development and strengthening of marketing linkages through establishment of Modern Hygienic Fish Markets and Mobile retail outlets.
e. To facilitate transport of fish equipped with cold storage facilities such as Insulated vans, Refrigerated trucks and Oxygenated vans that ensure longer shelf life of fish.
f. Establishment of Laboratories for curtailing the loss incurred in fish culture and to facilitate diagnostic and prophylactic measures and treatment of diseases.

3. **Mission III: Conservation of Indigenous Fisheries Resources**

a. Establishment of sanctuaries for conservation of indigenous and endemic species
b. Increased wild stock in natural environment.
c. To provide breeding and feeding grounds for fish.
d. Promote tourism in the state.
e. To serve as the study ground for researchers and scholars.
f. Encourage community participation with regard to conservation, and
g. Improve the livelihoods of the local communities.

4. **Mission IV: Capacity Building and Human Resources.**

a. To enhance the knowledge, skills, capacity, competencies and human resources of various stakeholders, and officials etc. through training programmes, workshops and exposure visits.

b. Creation and strengthening of training infrastructure for conducting various workshops, training programmes, demonstrations etc.

c. To motivate and encourage leadership of the stakeholders, farmers, entrepreneurs and to enhance their ability to perform in adverse environment

5. Mini Mission V: Emerging opportunities in Fisheries Sector

a. To create a general awareness on the latest technology and culture systems in the Fisheries Sector in both Culture and Capture segments.

b. Create entrepreneurship and livelihood opportunities through activities that are associated with fisheries, such as Aqua parks, sports fishing, etc.

c. Promote non-conventional modes of employment and livelihood through fisheries sector through Aqua tourism etc.

The mission targets are sought to be achieved in five years by working in close collaboration and coordination with the stakeholders, farmers, entrepreneurs and other Line departments. The mission in its span of five years strives to carry out the project taking into consideration the gaps observed during the implementation of MSAM 1.0 and by adopting strategic means to delineate such constraints. Regular review meetings with the officials from the banking institutions will be carried out, so as to facilitate the smooth functioning of the Mission. Apart from the review meetings, quarterly reports on the implementation of the project will be generated to help better monitor the projects.

Individual pond in North Garo Hills

CHAPTER - III

Mini Mission I - Area Expansion and Productivity

Through the Meghalaya State Aquaculture Mission 1.0 (MSAM) the state has brought in an additional water area of 1808.80 hectares between2012-2017. The state through creation of individual ponds has uplifted the livelihoods of the rural people and provided employment to the local youth. The state still needs to develop more water area to meet the increasing demand of fish. Under MSAM 2.0 it is sought to assist a minimum water area starting from 0.05 Hectare to a maximum water area of 1.0 Hectare to encourage more participation of the beneficiaries under the Mission. Construction of new ponds will be implemented mostly in the individual lands, community lands (on lease) etc. Meghalaya has vast land areas under the control of the village communities. The people of the state exhibit strong community engagement in fish capture in the rivers. If this takes place in the culture, rather than capture from the rivers, it will protect the indigenous fish species from extinction. The state has many untapped resources from the reservoirs and lakes. The state also has gained momentum from the practice of paddy-cum-fish culture. The water used for agriculture is also utilized for fish culture.

3.1 Construction of new ponds under individual category:

To convert idle lands into productive units for income generation and livelihood to the rural population, new ponds will be established. The MSAM 2.0 will develop and bring more water area into fish farming. Under MSAM 2.0, the target will be set on a yearly basis and the scheme allocation will be as per the demand, and districts having potential in implementing the projects will be prioritised. The tentative budget allocation for construction of individual ponds is shown in Table No. 3.

Individual pond at West Jaintia Hills

Table 3. Area Expansion through individual ponds (2018-19 to 2022-2023) for 5 years

(Rs. in lakhs)

Year	Water Area (Ha.)	Budgeted allocation (per Ha)	Total financial implication	Government Subsidy	Credit Linkage	Beneficiary contribution
2018-19	300	11.255	3376.5	2025.9	844.125	506.475
2019-20	300	11.255	3376.5	2025.9	844.125	506.475
2020-21	300	11.255	3376.5	2025.9	844.125	506.475
2021-22	300	11.255	3376.5	2025.9	844.125	506.475
2022-23	300	11.255	3376.5	2025.9	844.125	506.475
STATE TOTAL	**1500 Ha.**	**-**	**16882.5**	**10129.5**	**4220.625**	**2532.375**

Cost of construction of individual ponds:

The cost of construction of pond depends on the size of the pond which in turn depends on the topographical conditions of the land. There are many suitable lands in the state which are less than 0.1 Ha which are feasible for fish culture, MSAM 2.0 provides a scope for a minimum water area of 0.05 Ha. Earth work is a major component for pond construction and it is estimated at ` 35,000, input cost being ` 20,750 and the additional cost is ` 10,500. The total project cost is ` 66,250.The cost of construction of a pond depends on the pond size ranging from 0.05 Ha to 1.0 Ha.

Individual pond at West Garo Hills

Table 4. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 1.0 ha.

1. Capital Cost				
Sl No	**ITEMS**	**Unit**	**Rate (`)**	**Amount (`)**
a	Land clearing/Pond excavation	1.0 Ha	7.0 lakh/Ha	7,00,000
	Total 1			**7,00,000**
2. Input Cost				
a	Lime (Kg)	1000	20	20,000
b	Raw Cow Dung (Kg)	10000	2	20,000
c	Fish Fingerlings (per no.)	10000	2	20,000
d	Formulated Feed (Kg)	4500	50	2,25,000
e	Health Care		L/S	10,000
f	Fishing Equipments / materials etc.			1,00,000
g	Labour		L/S	20,000
	Total 2			**4,15,000**
	Total (1 + 2)			**11,15,000**
3. Additional Fixed costs				
a	A.C pipes (Nos)	4	1,375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**11,25,500**
4. Financing of scheme				
a	Government Subsidy		@ 60%	6,75,300
b	Credit Linkage		@ 25%	2,81,375
c	Own contribution		@ 15%	1,68,825
	TOTAL			**11,25,500**

Table 5. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 0.5 Ha.

1. Capital Cost

Sl No	ITEMS	Unit	Rate (`)	Amount (`)
a	Land clearing/Pond excavation	0.5	7.0 lakh/Ha	3,50,000
	Total 1			**3,50,000**
2. Input Cost				
a	Lime (Kg)	500	20	10,000
b	Raw Cow Dung (Kg)	5000	2	10,000
c	Fish Fingerlings (per no.)	5000	2	10,000
d	Formulated Feed (Kg)	2250	50	1,12,500
e	Health Care		L/S	5,000
f	Fishing Equipments / materials etc.			50,000
g	Labour		L/S	10,000
	Total 2			**2,07,500**
	Total (1 + 2)			**5,57,500**
3. Additional costs				
a	A.C pipes (Nos)	4	1,375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**5,68,000**
3. Financing of scheme				
a	Government Subsidy		@ 60%	3,40,800
b	Credit Linkage		@ 25%	1,42,000
c	Own contribution		@ 15%	85,200
	Total			**5,68,000**

Table 6. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 0.4 Ha.

1. Capital Cost

Sl No	ITEMS	Unit	Rate (`)	Amount (`)
a	Land clearing/Pond excavation	0.4	7.0 lakh/Ha	2,80,000
	Total 1			**2,80,000**
2. Input Cost				
a	Lime (Kg)	400	20	8,000
b	Raw Cow Dung (Kg)	4000	2	8,000
c	Fish Fingerlings (per no.)	4000	2	8,000
d	Formulated Feed (Kg)	1800	50	90,000
e	Health Care		L/S	4,000
f	Fishing Equipments / materials etc.			40,000
g	Labour		L/S	8,000
	Total 2			**1,66,000**
	Total (1 + 2)			**4,46,000**
3. Additional costs				
a	A.C pipes (Nos)	4	1,375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**4,56,500**
4. Financing of scheme				
a	Government Subsidy		@ 60%	2,73,900
b	Credit Linkage		@ 25%	1,14,125
c	Own contribution		@ 15%	68,475
	Total			**4,56,500**

Table 7. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 0.3Ha.

1. Capital Cost

Sl No	ITEMS	Unit	Rate (`)	Amount (`)
a	Land clearing/Pond excavation	0.3	7.0 lakh/Ha	2,10,000
	Total 1			**2,10,000**
2. Input Cost				
a	Lime (Kg)	300	20	6,000
b	Raw Cow Dung (Kg)	3000	2	6,000
c	Fish Fingerlings (per no.)	3000	2	6,000
d	Formulated Feed (Kg)	1350	50	67,500
e	Health Care		L/S	3,000
f	Fishing Equipments / materials etc.			30,000
g	Labour		L/S	6,000
	Total 2			**1,24,500**
	Total (1 + 2)			**3,34,500**
3. Additional costs				
a	A.C pipes (Nos)	4	1375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**3,45,000**
4. Financing of scheme				
a	Government Subsidy		@ 60%	2,07,000
b	Credit Linkage		@ 25%	86,250
c	Own contribution		@ 15%	51,750
	Total			**3,45,000**

Table 8. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 0.2 Ha.

1. Capital Cost

Sl No	ITEMS	Unit	Rate (`)	Amount (`)
a	Land clearing/Pond excavation	0.2	7.0 lakh/Ha	1,40,000
	Total 1			**1,40,000**
2. Input Cost				
a	Lime (Kg)	200	20	4,000
b	Raw Cow Dung (Kg)	2000	2	4,000
c	Fish Fingerlings (per no.)	2000	2	4,000
d	Formulated Feed (Kg)	900	50	45,000
e	Health Care		L/S	2,000
f	Fishing Equipments / materials etc.			20,000
g	Labour		L/S	4,000
	Total 2			**83,000**
	Total (1 + 2)			**2,23,000**
3. Additional costs				
a	A.C pipes (Nos)	4	1375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**2,33,500**
4. Financing of scheme				
a	Government Subsidy		@ 60%	1,40,100
b	Credit Linkage		@ 25%	58,375
c	Own contribution		@ 15%	35,025
	Total			**2,33,500**

Table 9. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 0.1 Ha.

1. Capital Cost

Sl No	ITEMS	Unit	Rate (`)	Amount (`)
a	Land clearing/Pond excavation	0.1	7.0 lakh/Ha	70,000
	Total 1			**70,000**
2. Input Cost				
a	Lime (Kg)	100	20	2,000
b	Raw Cow Dung (Kg)	1000	2	2,000
c	Fish Fingerlings (per no.)	1000	2	2,000
d	Formulated Feed (Kg)	450	50	22,500
e	Health Care		L/S	1,000
f	Fishing Equipments / materials etc.			10,000
g	Labour		L/S	2,000
	Total 2			**41,500**
	Total (1 + 2)			**1,11,500**
3. Additional costs				
a	A.C pipes (Nos)	4	1375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**1,22,000**
4. Financing of scheme				
a	Government Subsidy		@ 60%	73,200
b	Credit Linkage		@ 25%	30,500
c	Own contribution		@ 15%	18,300
	Total			**1,22,000**

Table 10. Detailed Estimates of Capital and Operational Costs including Excavation of Individual Pond

Area 0.05 Ha.

1. Capital Cost

Sl No	ITEMS	Unit	Rate (`)	Amount (`)
a	Land clearing/Pond excavation	0.05	7.0 lakh/Ha	35,000
	Total 1			**35,000**
2. Input Cost				
a	Lime (Kg)	50	20	1,000
b	Raw Cow Dung (Kg)	500	2	1,000
c	Fish Fingerlings (per no.)	500	2	1,000
d	Formulated Feed (Kg)	225	50	11,250
e	Health Care		L/S	500
f	Fishing Equipments / materials etc.			5,000
g	Labour		L/S	1,000
	Total 2			**20,750**
	Total (1 + 2)			**55,750**
3. Additional costs				
a	A.C pipes (Nos)	4	1375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**66,250**
4. Financing of scheme				
a	Government Subsidy		@ 60%	39,750
b	Credit Linkage		@ 25%	16,563
c	Own contribution		@ 15%	9,938
	Total 3			**66,250**

Individual Ponds

Individual pond at West Khasi Hills

Individual pond at North Garo Hills

Individual pond at East Garo Hills

Individual pond at West Jaintia Hills

Individual pond at East Khasi Hills

Individual pond at South West Garo Hills

3.2. Construction of new ponds under the Community category:

The experience of MSAM 1.0 in the implementation of community ponds in the state, has been positive, so it has been decided to continue with the programme under MSAM 2.0 so that this will strengthen the community based practice in fishery activity among the SHGs / Co-operative societies / villages etc. Besides providing for better nutritional aspects to the community, it will also encourage more people to adopt fish culture and fish practices in the state commercially.

Community Fishery pond at Nongkasen, West Khasi Hills

Table 11. Year wise target for construction of Community ponds

(Rs. in lakhs)

Year	Water Area (Ha.)	No. of community ponds	Budget allocation (per Ha)	Total financial implication	Government Subsidy	Beneficiary contribution
2018-19	10	10	11.255	112.55	67.53	45.02
2019-20	10	10	11.255	112.55	67.53	45.02
2020-21	10	10	11.255	112.55	67.53	45.02
2021-22	10	10	11.255	112.55	67.53	45.02
2022-23	10	10	11.255	112.55	67.53	45.02
STATE TOTAL	**50**	**50**	**56.275**	**562.75**	**337.65**	**225.1**

Cost of contribution:

Construction of a community pond is based on the Government of India norms of Blue Revolution in which ` 7.0 lakh/Ha is earmarked for the construction work. Earth work is a major component for pond construction and it is estimated at ` 7,00,000/- per hectare in which the input cost is ` 4,15,000/- and the additional cost is ` 10,500/-. The total project cost is ` 11, 25,500/- out of which ` 6, 75,300/- is the Government subsidy and ` 4,50,200/- is the community contribution. The project cost differs according to the pond size and the calculation varies accordingly.

Table 12. Detailed Estimates of Capital and Operational Costs including the Excavation of Community Pond

Area 1.0 Ha.

1. Capital Cost

Sl No	**ITEMS**	**Unit**	**Rate (`)**	Amount (`)
a	Land clearing/Pond excavation	1.0 Ha	7.0 lakh/Ha	7,00,000
	Total 1			**7,00,000**
2. Input Cost				
a	Lime (Kg)	1000	20	20,000
b	Raw Cow Dung (Kg)	10000	2	20,000
c	F/seed (per piece)	10000	2	20,000
d	Formulated Feed (Kg)	4500	50	2,25,000
e	Health Care		L/S	10,000
f	Fishing Equipments / materials etc.			1,00,000
g	Labour		L/S	20,000
	Total 2			**4,15,000**
	Total (1 + 2)			**11,15,000**
3. Additional Fixed costs				
a	A.C pipes (Nos)	4	1,375	5,500
b	Signboard (Nos)	1	5,000	5,000
	Total 3			**10,500**
	GRAND TOTAL (1+2+3)			**11,25,500**
4. Financing of scheme				
a	Government Subsidy		@ 60%	6,75,300
b	Own contribution		@ 40%	4,50,200
	TOTAL			**11,25,500**

Nangiaishlei Community fishery pond at West Khasi Hills

Umlyngkdait Community fishery pond at Ri-Bhoi

Kyntiewlakadong Community fishery pond at South West Khasi Hills

3.3 Paddy-Cum-Fish Culture:

Production of fish in rice fields is almost as old as the practice of paddy cultivation itself. As water stagnates in the fields for paddy culture, fishes which naturally occur in the nearby tanks and pools enter the paddy fields and grow there along with paddy until harvest time. This type of fish production dates back from very early days, even though it was based on capture rather than culture. Rice and fish exist at some level together for food particularly in South East Asian countries and there are age old systems prevalent for their combined cultivation in India.

Fish culture in rice fields also known as Rizipisciculture, offers one of the best means of concurrent production of grain and animal protein on the same piece of land which also serves as the most optimal method of land use. This type of culture is also the production of nutritionally balanced food at the source itself.

Paddy cum Fish culture : Fish Harvest at Shangpung

Fish Culture in Rice Fields – Culture Operations

As per the techniques developed by the ICAR institutions, the texture and properties of soil, its water retentive capacity and suitability as a constructional material to build up the surrounding dykes should be determined so as to provide the rice field with strong and impervious bunds. The layout of the paddy plot that can be adopted for this practice includes perimeter, bowl, lateral canal or marginal pond type. Paddy cultivation in our state is done during the month June-August. Only transplanted paddy system can be adopted for this practice. Fish species such as Common carp varieties, the improved variety of common carp which is the Amur carp etc. maybe stocked ranging from 3000-6000/ha, *Labeo bata* among minor carp can also form a stocking component in this system, *Puntius javanicus* has also been observed to grow well in this type of culture.

Paddy cum Fish culture

Scope of Paddy-cum-Fish Culture:

This type of integrated fish farming can provide a good scope for fish culture as this can mean a source of additional income besides paddy which is a primary agriculture. In addition to this the whole family can also get a source of protein from fish harvest from the paddy field. This method can be encouraged in the potential districts of the state.

This practice can be adopted in the following:-

1. Terrace paddy farming having sufficient areas.
2. Paddy farming in low lying areas.

Table 13. Paddy-cum-fish culture: Allocation (2018-19 to 2022-2023) for 5 years

(Rs. in lakhs)

Year	Water Area (Ha.)	No. of units	Budget allocation (per Ha)	Total financial implication	Government Subsidy	Beneficiary contribution
2018-19	68	680	0.21	142.8	85.68	57.12
2019-20	68	680	0.21	142.8	85.68	57.12
2020-21	68	680	0.21	142.8	85.68	57.12
2021-22	68	680	0.21	142.8	85.68	57.12
2022-23	68	680	0.21	142.8	85.68	57.12
STATE TOTAL	**340 Ha.**	**3400**	**1.05**	**714**	**428.4**	**285.6**

Table 14. Detailed Estimate for Construction of Trenches and Input cost etc for Paddy cum fish culture

A. Capital cost for 0.1 Ha.

Sl No	Items	Unit	Rate	Amount (`)
a	Land clearing/Trench excavation	0.02	6 Lakhs/ Ha	12,000
			TOTAL A	**12,000**
B. Input cost for 0.1 Ha				
a	Lime (Kg)	20	20	400
b	Raw Cowdung (Kg)	200	2	400
c	Fish fingerlings (@ 3 nos / m^2)	600	2	1,200
d	Formulated Feed (Kg)	90	50	4,500
			TOTAL B	**6,500**
C. Misc Expenses				
a	Miscellaneous Expenses		**L/S**	2,500
			Total Cost	**2,500**
GRAND TOTAL (A+B+C)				**21,000**

CHAPTER – IV

Mini Mission – II Critical Infrastructure Development

Mini Mission II of the MSAM 2.0 was conceptualised with the aim to address two major critical components- Seed and Feed. This has led to success in terms of fish seed production with a production of 9.69 million fry in the year 2017-18. With the launch of MSAM in 2012, the Department of Fisheries has been able to complete 26 hatcheries, and 3 Fish feed mills, boosting the production of fish seed in the whole state of Meghalaya.

Table: 15. Assisted Hatcheries under MSAM (Eco Hatchery & FRP Hatchery)

Scheme	Year	Amount Sanctioned (in crores)	Target		Achievement	
			Nos. / Units	Project Area (Ha.)	Nos. / Units	Project Area (Ha.)
State Aquaculture Mission						
a. Fish Seed Hatchery (Eco - Hatchery)	2013-14	0.48	5	10.00	5	10.00
Fish Seed Hatchery (Eco - Hatchery		0.67	7	14.00	7	14.00
b. Fabricated Reinforced Plastic (FRP) Hatchery	2013-14	0.33	14	14.60	14	14.6
TOTAL	**-**	**1.48**	**26**	**38**	**26**	**38.6**

FRP Hatchery

ECO Hatchery at Umsning, Ri-Bhoi

4.1 Fibre Reinforced Plastic Hatcheries:

It was observed through MSAM 1.0 that the FRP hatcheries had better performance and acceptability in the State for Fish seed Production than the conventional Eco Hatcheries. This inducted Technology from CIFA is well suited for the hilly terrain of the State as the land holdings are smaller.

The salient features of FRP fish Hatchery are: -

- Easy to transport to different locations.
- Easy to install and operate.
- Low water consumption during fish breeding and spawning.
- Requires less space for installation and can even be placed on a pond's dyke.
- Easy to repair and replace minor fittings.
- Suitable for small scale breeding with production capacity of up to 1 million number of spawn of Asiatic carp in one operation.
- Less weight and also durable for 15 years.
- Less expensive.

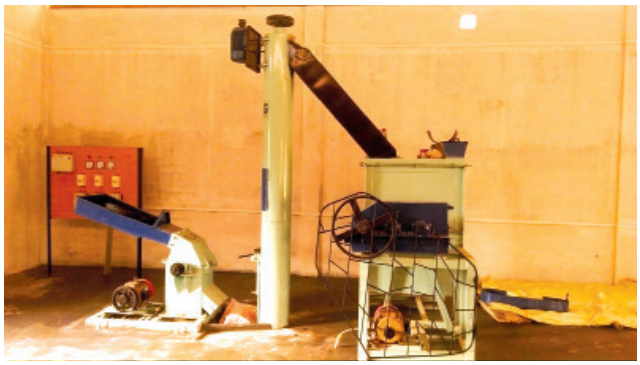
With the steady rise in fish seed production and to further add to the availability of fish seed to the fish farmers, the Department of Fisheries has decided to increase the target of FRP hatcheries under the MSAM 2.0.Progressive individual / fish farmers, Self-help groups (SHGs), Cooperatives Societies etc. having a minimum water area of 0.5 hectare would be encouraged under the MSAM 2.0.

Table 16: FRP's: allocation (2018-19 to 2022-2023) for 5 years

Year	Nos. of FRPs
2018-19	17
2019-20	17
2020-21	17
2021-22	17
2022-23	17
STATE TOTAL	**85**

4.2 Fish Feed Mills:

With the increase in the number of potential farmers for Fish Culture, there has also been an increased demand for feed. Addressing the issue of on-availability of feed will be of utmost importance in MSAM 2.0. Setting up of small and medium scale Feed Mills will be taken up under this component to ensure regular supply of feed in the State. Potential entrepreneurs would be trained in the technology in CIFA Bhubaneshwar and would also be taken on exposure visits to progressive entrepreneurs and institutes for on hands training and exposure. It is projected that 10 Nos of medium and 50 Nos. of small Feed Mills would be established during the course of MSAM 2.0.



Fish feed mill at Ri Bhoi District

4.3 Modern Hygienic Fish Markets and Mobile Retail Outlets:

Development of a strong market system for hygienic marketing of fish would be addressed under the MSAM 2.0. Being a highly perishable commodity, good management practices for hygienic handling and marketing of fish can ensure that the locally produced fish fetch higher market price**.** Loss of commodity due to poor handling and storage should be addressed so the marketability of fish improves.

a. At least 10 Modern Hygienic Markets, equipped with cold storage facilities would be established in the State. These markets would be equipped with amenities of vesicoolers, tools and freezers to ensure longer shelf life of fish. The market would also be equipped with a cold chain to ensure the mass storage / freezing amenities for the bulk product.

b. Entrepreneurs for mobile retail units would also be identified. These mobile units would be the market on wheels for fish and would be a major employer of youth in peri-urban and urban areas where space for markets is limited.

c. Modern Hygienic Transportation Units:Establishment of a good Marketing linkage from the source of production to the end consumer is one of the most essential aspects for realising the viable outcomes of the Mission. Fish being a highly perishable commodity, the quality assurance to consumers can only be assured through interventions in transportation facilities for maintaining the quality of the commodity. Introduction of modern hygienic transportation facilities such as insulated vans, Refrigerated Trucks and Oxygenated Vans will therefore be considered under MSAM 2.0. This intervention could also be a good opportunity for capturing local markets, generate gainful employment in rural and peri-urban beneficiary groups through promotion of these linkage channels. The assistance as per the Blue Revolution guidelines CSS guidelines would be given to SHGs/Cooperative societies/Individuals etc. Funding support may be solicited under the externally aided projects, through international agencies viz., KFW, for this Mini Mission.

Modern Hygienic Fish Market at Nongpoh

Table 16. Budget for Modern Hygienic Transportation Facilities

(Rs. in lakhs)

Sl No.	Particulars	Number of Units per Year	Anticipated Cost Per Unit	Number of Units for Five Years	Amount
1	Insulated Vans	2	15.00	10	150.00
2.	Refrigerated Trucks	2	25.00	10	250.00
3.	Oxygenated Vans for live fish	2	20.00	10	200.00
TOTAL					**600.00**

Cooperative societies/ SHG's/Communities etc. would be identified to take up the scheme in a PPP mode. Assistance along with training would be given to potential entrepreneurs in the Post-Harvest and Best Management Practices in the Sector.

4.4. Aquatic Laboratories

The Aquaculture sector suffers a loss of about 10-15% of the production cost due to disease. Such bottlenecks for aquaculture development can be reduced if scientific health management is practised. Maintenance of quality standards for aquaculture products being marketed domestically is a concern. Through the establishment of aquatic laboratory, these issues would be addressed. A state of the art laboratory therefore, is proposed to be established at MSFR&TI. This laboratory would be equipped with a full-fledged diagnostic support and service for disease diagnosis of aquatic organisms for disease surveillance. This would enable strengthening of health services and surveillance in line with the national disease surveillance programme. To develop a cost effective and reliable quality standard certification system/network, every district would also be equipped with an aquatic health centre in which basic analysis of physical and chemical water quality parameters and health assessment of aquatic organisms can be carried out.

Health monitoring and management is a very important aspect to be covered in the mission. The MSPs who are the first line of contact will need to be equipped with latest rapid tools/ technologies, detection kits, for analysis of critical soil/water parameters. For effective screening for potential disease outbreaks, quality assurance of harvested commodity the MSPs would be provided with the latest tools, kits etc. as standardize from time to time by national fisheries institutions.

Table 17. Tentative Budget requirements for Aquatic Laboratories

(Rs. in lakhs)

Sl. No.	Items	Unit	Capital cost	Recurring cost	Recurring cost for 5 years	Total
1	State Laboratory at MSFR&TI	1	100.00	50.00	250.00	350.00
2	Diagnostic Tools & kits	1	-	3.5	17.50	17.50
TOTAL						**367.50**

Table 18. Total Project cost for Mini Mission II Critical Infrastructure Development

(Rs. in lakhs)

Sl No.	Particulars	Number of Units per Year	Number of Units for Five Years	Anticipated Cost Per Unit	Amount
1	FRP hatchery	17	85	8.09	687.65
2.	a) Feed Mill (medium)	-	10	25	250.00
	b) Feed Mill (small)	10	50	10	500.00
3.	Modern Hygienic Markets	2	10	100.00	1000.00
4	Retail Units (Mobile/Kiosks)	20	100	10.00	1000.00
5	Transportation				
	a) Insulated Vans	2	15.00	10	150.00
	b) Refrigerated Trucks	2	25.00	10	250.00
	c) Oxygenated Vans for live fish	2	20.00	10	200.00
6	a) Aquatic laboratories	-	1	-	350.00
	b) Diagnostic tools & kits	-	1	3.50	17.50
TOTAL					4485.15

FRP unit at MSFR&TI, Mawpun

Table 19: Budget for Mini Mission II Critical Infrastructure Development

(Rs. in lakhs)

Sl No.	Particulars	Number of Units per Year	Number of Units for Five Years	Anticipated Cost Per Unit	Amount	Govt. Assistance	Credit Linkage	Beneficiary Share
1	FRP hatchery	17	85	8.09	687.65	412.59	171.91	103.15
2.	a) Feed Mill (medium)	-	10	25	250.00	150.00	62.50	37.50
	b) Feed Mill (small)	10	50	10	500.00	300.00	125.00	75.00
3.	Modern Hygienic Markets	2	10	100.00	1000.00	600.00	250.00	150.00
4	Retail Units (Mobile/Kiosks)	2	10	10.00	1000.00	600.00	250.00	150.00
5	Transportation							
	a) Insulated Vans	2	15.00	10	150.00	90.00	37.50	22.50
	b) Refrigerated Trucks	2	25.00	10	250.00	150.00	62.50	37.50
	c) Oxygenated Vans for live fish	2	20.00	10	200.00	120.00	50.00	30.00
6	Aquatic laboratories	-	1	-	350.00			
7	Diagnostic tools & kits	-	1	3.50	17.5			
	TOTAL				**4405.15**	**2422.59**	**1009.41**	**605.65**

CHAPTER - V

Mini Mission – III Conservation of Indigenous Fisheries Resources

Meghalaya is endowed with rich fisheries resources. It has been documented that the State has 159 fish species endemic to the State. The rivers of Meghalaya are a repository of these aquatic Biodiversity. With the launch of the Meghalaya State Aquaculture Mission, a focus toward conservation of the aquatic biodiversity was given, through the Mass Awareness Campaigns and establishment of Fish Sanctuaries along the stretches of rivers. It has been observed that the initiative was widely accepted and appreciated by the communities dependent on these river stretches as they also reaped secondary benefits of livelihoods through these sanctuaries.

The outcomes of the Mission were manifold viz:

1. Stock restoration/ rejuvenation of local indigenous fish species *in situ*
2. Increased capture of food fish in the State.
3. Protection of other aquatic fauna like tortoises, frogs etc. and aquatic flora that were thriving in the area.
4. Increased rural tourism.
5. New Sources of livelihoods and income for the local communities emerged.

54 (fifty four) Fish Sanctuaries have been sanctioned in the State under the MSAM 1.0. These sanctuaries have become shining examples of community participation and community initiatives. Under MSAM 2.0 it is proposed that more such Sanctuaries would be created along the stretches of Rivers and streams. Possibilities of extending the existing Sanctuaries would also be considered on a case to case basis.

Other activities under this Mini Mission will cover are:

- Setting up of Hatcheries for indigenous species,
- Studying the flexibility of documentation and breeding of local indigenous ornamental Fish Species.

Nonglatem Fish Sanctuary, West Jaintia Hills

Syntu Ksiar Fish Sanctuary, West Jaintia Hills

Mode of Implementation:

a. Survey and Study :

For Identification and stock assessment of existing fish resources through sampling, potential sites for conservation (breeding grounds, natural habitats) rigorous methods of PRA and other tools of sampling will be utilised. Existing exploitation pattern of these natural resources would be studied at large, to understand the level of conservational measures to be taken up.

b. Awareness Campaigns / Cleaning Drives/ community Mobilisation programmes:

General Awareness through multiple interfaces on the importance of conservation and the need for rigorous participation of Community, Government and Non-Government Institutions will be taken up under the mission. Awareness would be created through various print and electronic Media. Regular campaigns and Public Meetings would be conducted for dissemination of knowledge on conservational measures and existing norms, guidelines, and laws for conservation. Cleaning drives would be conducted along potential water ways to highlight the need for community participation.

c. Establishment of fish Sanctuaries:

The primary objective behind the establishment of sanctuaries was for conservation of aquatic biodiversity, natural breeding and feeding grounds and stock restoration of endangered fish species. These sanctuaries also provided livelihood and income as they became hubs for Eco Tourism. Assistance for Establishment of Sanctuaries would continue in the same pattern as MSAM 1.0 under which a one time grant was given to interested NGOs/Self Help Groups/ Communities etc. Minor construction of mini barrages without altering the natural paths / flow of the river would be taken up along with other construction viz, view point/watch tower, approach roads and Foot paths would be taken up on case to case basis. Investment will also be made for providing one time inputs of seed and other equipment and gears for the management of the sanctuaries as per the guidelines laid down by the Department under the Fisheries Act. 50 (fifty) such sanctuaries will be established in the state during the MSAM 2.0

Thwailaroit Fish Sanctuary , West Jaintia Hills

Table 20: Fish sanctuaries (2018-19 to 2022-2023)

Year	Nos. of sanctuaries
2018-19	10
2019-20	10
2020-21	10
2021-22	10
2022-23	10
TOTAL	**50**

d. Ex Situ Conservation Measures:

Prospects for study of Culture and Breeding of Indigenous Fish species (consumption value and ornamental value) would also be explored. One Mahseer Hatchery has already been set up at West Garo Hills on the banks of the Ganol River and a few more such initiatives for propagation of indigenous species will also be considered under Mini Mission III of MSAM 2.0. Declaration of State Fish, based ona study of the existing natural stock would also be taken up under the Mission.

Table 21: Details of ActivitiesEvents under Mini Mission III

(Rs. in lakhs)

Sl. No	Details	No events per Year	Anticipated Cost	Total Nos of Events for 5 years	Total Anticipated Cost for 5 years
1	Survey and Study for Conservation and Fisheries Resources	22	0.20	110	22.00
2	Awareness Campaigns / Cleaning Drives/ community Mobilisation programmes				
	Awareness Campaigns	15	.50	75	37.50
	Cleaning Drives	22	.50	110	55.00
	Community Mobilisation Programmes	49	.50	245	122.50
3	**Establishment of fish Sanctuaries:**	10	5	50	250.00
4	**Ex Situ Conservation Measures**:				
	Setting up of Mahseer Breeding Units	1	10	5	50.00
	Indigenous Ornamental conservational units (survey & study)	5	2.5	25	62.50
	Grand Total				599.50

Catch & release fishing completion organised by the Department at Ward's lake

Nengmandalgre Fish Sanctuary, East Garo Hills

Jadisil Fish Sanctuary, South Garo Hills

CHAPTER – VI

Mini Mission IV - Capacity Building and Human Resource Development

The core foundation upon which the success of Fisheries in Meghalaya is realized is through capacity building and human resources. Capacity Development (CD) as defined by OECD is the "process whereby people, organizations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time". The Mission envisages to develop and strengthen the core of human and institutional resources of the state by going beyond the Government sector, i.e, commercial enterprises and non-Governmental organizations. In short, it will focuses on achieving the objectives of the Mission by delivering the services atthe Individual and Institutional levels. The Department of Fisheries undertakes capacity building for Aquaculture and allied activities which include training on scientific know-how of Fish culture, preparation of training materials, raising awareness through workshops and training, efficient management of hatcheries, fish seed production, ornamental fishery, fish production in ponds and tanks, disease management, fish feed production, processing and marketing of fish, etc.

There are two main components of this Mini Mission. They are –

1. Building the capacities of the stakeholders, and
2. Creating/strengthening the training infrastructure

1. Building the Capacities of Stakeholders:

Capacity building is all about enhancing the capacities of the fish farmers. Fish farmers being the major stakeholders, need capacity building to perform the tasks productively and efficiently as far as Aquaculture and its allied activities are concerned. At the institutional level, the capacity building is essential for strengthening the skills and competencies of the departmental officials pertaining to the recent advances in Aquaculture practices at national and international levels. The framework and methodologies designed for raising awareness include participatory approaches through demonstrations and pilot testing.

Furthermore, capacity building will be streamed through the following activities:

1. Training and exposure visits for Officers
2. Training and exposure visits for fish farmers
3. Training and exposure visit for Programme Managers and MSPs
4. Capacity building of Fishery Co-operators
5. Entrepreneurship development in the fisheries sector (Fishpreneurship development)


Technical Class at MSFR&TI


Practical training

Field visit of Trainees

Trainees at MSFR&TI

2 Creating / strengthening training infrastructure:

One of the important elements that facilitate learning effectively is the context in which the message is delivered and to a great extent the trainingenvironment. An ideal training infrastructure not only offers the learner/farmers to interact freely and constructively but also instills in them the desire to learn, it motivate learners to perform better. The training facilities at the Directorate, Shillong and Meghalaya State Fisheries Research and Training Institute (MSFR&TI) at Mawpun seek to address the gap in learning between the trainer and the learner by delivering the best of services. The training facilities are equipped with good ventilation and instruction aids such as audio visuals, overhead projectors and a good sound system. Till date, with the implementation of Meghalaya State Aquaculture Mission (MSAM 2012-17) the State Training Institute "Meghalaya State Fisheries Research and Training Institute has trained more than 5500 Nos. of the progressive fish farmers and opinion leaders. Although the training centre has been instrumental in reducing the gap in technology transfer, yet the department faces many shortcomings due to lack of man power and proper infrastructure such as Laboratory, Library, auditorium etc. Therefore, it is proposed to expand the capacity of the MSFR&TI, so it should be able to train at least 10,000 farmers a year. Likewise, there is also a case for expanding the manpower set up in the MSFR&TI, so competent trainers and researchers become available for better capacity building of the departmental functionaries as well as the farmers.

The Meghalaya State Fisheries Research & Training Institute at Mawpun, Ri-Bhoi District

Table 22: Breakup of Capacity building for farmers at MSFR&TI, Mawpun

(Rs. in lakhs)

Sl. No.	Particulars	Training for 1 year						Total Amt. for 5 years
		Nos/year	Nos. Per batch	Total	Duration	Unit Cost	Amt.	
1	**Capacity building of stakeholders**							
	a. Training of Prospective Fish Farmers	60 batch-es	40	2400	5 days	2	120	600
	b. Training for Field Staff	1 batch	40	40	3 months	10	10	50
	c. Training & exposure visits for Multiple Service Providers	1 batch	40	40	10 days	2	2	10
	d. Refresher's course for Depart-mental Field Staff.	1batch	40	40	3 days	1	1	5
	e. Exposure visit of fish farmers to Fisheries Institutions and private fish farms outside the State.	1	30	30	5days	2	2	10
TOTAL								**675**

Table 23: Tentative Budget requirement for Capacity Building &HRD (2018-19 to 2021-22)

(Rs. in lakhs)

Sl. No	Particulars	Nos.	Unit cost	Total amount for 5 years
1	Capacity building for farmers at MSFR&TI, Mawpun			675.00
2	Expansion/strengthening of training infrastructure at MS-FRTI			310.00
3	Capacity building for Officers (training & Exposure trip)	50	2.00	100.00
4	Capacity building of FFDA staff (training & Exposure trip)	10	4.00	40.00
5	Capacity building for Fish Co-operators	6	3.50	21.00
6	Orientation training programmes at Districts	220	0.30	66.00
7	Awards for Fish farmers	-	-	51.00
TOTAL				**1263.00**

Hands on training at Meghalaya State Fisheries Research & Training Institute, Mawpun

Induced breeding

Collection of Spawn

CHAPTER – VII

Mini Mission V - Emerging Opportunities in the Fisheries Sector

The vast natural fishery resources of Meghalaya indicate the huge potential for tapping resources for development of fisheries and aquaculture in the State. Diversification and tapping of these potential resources in the most innovative and sustainable way for development and income generation through the sector may be the answer for achieving maximum sustainable yield. The diverse geographical and agro-climatic conditions of the state call for a more need based approach and specific mode of action for development. In this Mini Mission the Department aims to bring into light the large untapped potential and latest trends in the Sector that would promote a more diverse approach in livelihood opportunities, employment and economic upliftment through the sector. This Mini Mission would address the recreational value of fisheries and aquaculture, potential culture systems of new species of food value, Ornamental Fisheries and development of Marketing Linkages through modern hygienic transportation facilities and any other innovation and emerging activity in the sector. The objectives of this Mini Mission are as follows:

- To create a general awareness on the latest technology and culture systems in the Fisheries Sector in both Culture and Capture segments.
- Create entrepreneurship and livelihood opportunities through fisheries sector activities.
- Promote non-conventional mode of employment and livelihood through fisheries sector through Aqua-tourism etc.

Mode of Implementation:

7.1 Aqua-parks:

Promotion of Tourism through aquaculture and Fisheries activities is at the core of Aqua tourism. In the MSAM 1.0, three (3) nos. of Aqua parks were set up in the State, which have highlighted the huge potential to take forward this component as one of the emerging opportunities in the sector. These Aqua parks are now tourism hubs with Fisheries and aquaculture resources occupying a major recreational and aesthetic value. These Parks are not only of recreational value but also of educational value as well. Successful examples such as Chenga Benga Aquapark in convergence have shown that these Aqua-parks may be a major component in which convergence activities of other line Departments with the Fisheries Department can be carried out successfully to achieve a holistic approach for development.

Under this component of the Mission, 20 (twenty) Aqua parks are proposed to be established throughout the State, in a span of 5 years. These Aquaparks would be established by the Department and handed over to the Community/ NGO's/ Societies / SHG's for maintenance and management. These parks would be a source of revenue and employment for youth and will benefit the society at large.

Wachi wari Fish Sanctuary, West Garo Hills

Table 24: Aqua Parks: Budget Allocation (2018-19 to 2022-2023) for 5 years

(Rs. in lakhs)

Particulars	Number of Units per Year	Anticipated Cost Per Unit	Number of Units for Five Years	Amount
Aqua parks	**20**	**35.00**	**5**	**700.00**
TOTAL	**20**	**35.00**	**5**	**700.00**

7.2 Ornamental Fisheries:

Meghalaya being one of the States that falls under the Indo Burma Biodiversity hotspots is the host to as many as 159 indigenous ornamental Fish species. Most ornamental Fish exported out of India are sourced from the North East.However, opportunities for marketing and development of standardised breeding and rearing technologies have not been developed. Ornamental Fisheries is one such sector in which potential for entrepreneurship development can be seen in all levels of production, culture, marketing and conservation. Ornamental fish keeping is one of the major hobbies in the world, and with a huge export potential. It is felt that this sector could be one of the emerging opportunities in the sector for entrepreneurship development.

The Scheme would consider two major aspects:

a. Development of Breeding & Rearing Units:

Potential Breeders and Rearers would be identified for the Establishment of such units. These Breeding & Rearing Units would promote a more sustainable approach deterring wild catches and promotion of culture of potential species, both commercial and indigenous.

Study and survey of standardised breeding techniques would be taken up in consultation with Fisheries Institutes such as ICAR/ CIFA etc. to establish the most suitable and sustainable method of development of this sector.

b. Aquarium Fabrication Units:

In the ornamental Fish Trade, Aquarium fabrication and manufacturing is one of the major areas for entrepreneurship development. Skill development in this area can be a major source of employment generation for unemployed youths. Aquarium Fabrication could be sourced directly for supply to Hobbyists as well as Retail Centres. Assistance and Training in this area would be extended to the potential entrepreneurs for holistic development of the sector.

c. Retail cum Hobby Centres:

These outlets for retail of ornamental fishes form a key component for capturing the market and creating linkage between producer and hobbyist. Apart from sale of ornamental fish, these units would also deal with the accessories required for trade of ornamental fishes such as live feed, pelleted feed, aquarium plants, aerators etc.

d. Capacity Building & Exposure Visit:

Potential entrepreneurs in the sector would be sent for training to CIFA, ICAR-NER. Exposure visits inside and outside the State would be conducted regularly for on field study and motivation from progressive farmers in the trade.

Table 25: Budget Requirements for Ornamental Fisheries

(Rs. in lakhs)

Sl. No.	Particulars	Number of Units per Year	Anticipated Cost Per Unit	Number of Units for Five Years	Amount
1.	Backyard rearing units	5	3.0	25	75.00
2.	Medium Scale rearing units	2	2	10	80.00
3.	Integrated ornamental fish units	-	25	1	25.00
4.	Input cost for backyard rearing units	5	0.4	25	2.00
5.	Input cost for Medium scale rearing units	2	1.20	10	12.00
6	Input costs for integrated ornamental fish unit	-	2.0	1	2.00
7.	Aquarium fabrication -cum- retail unit	2	3.00	10	30.00
8.	Input costs for Aquarium Fabrication –cum- retail unit	2	1.00	10	10.00
9.	Capacity building under ornamental Fisheries	2	2.5	10	25.00
	TOTAL				**261.00**

Table 26: Anticipated Budget for Emerging Opportunities

(Rs. in lakhs)

Sl. No.	Particulars	Unit Cost	No. of Units in 5 years	Total Amount	Govt. Assistance 60%	Beneficiary contribution 40%
1.	Aqua Parks	35.00	20	700.00	700.00	-
2.	*Ornamental Fisheries:*					
	Backyard rearing unit	3.0	25	75.00	45.00	30.00
	Medium Scale rearing unit	8.0	10	80.00	48.00	32.00
	Integrated ornamental fish unit	25	1	25.00	15.00	10.00
	Input cost for backyard rearing unit	0.4	25	2.00	1.20	0.80
	Input costs for Medium scale rearing unit	1.20	10	12.00	7.20	4.80
	Input costs for integrated ornamental fish unit	2.0	1	2.00	1.20	0.80
	Aquarium fabrication -cum- retail unit	3.00	10	30.00	18.00	12.00
	Input costs for Aquarium fabrication -cum- retail unit	1.00	10	10.00	6.00	4.00
	Capacity building under ornamental fisheries	2.5	10	25.00	25.00	-
	TOTAL			**961.00**	**866.60**	**94.40**

Phod Ja-ud Aqua Park during its inauguration, October 2018

CHAPTER - VIII
Convergence under the Meghalaya State AquacultureMission 2.0

Sustainable Development can be witnessed when sectors start breaking silos and move toward a more synergistic implementation strategy in different developmental Programmes. Convergence would bring in a more holistic and integrated approach in which duplication of efforts can be avoided and gap filling between efforts of development can be carried out. Convergence can also be thematic, schematic, financial or technological convergence.

Objectives:

- To avoid redundant action.
- Effective Linkage between programmes/ initiatives with similar objectives.
- Sustainable usage of Resources.
- Identification of New opportunities for Livelihood and income generation.

Scope of Convergence:

Fisheries being the sunrise sector with water being as the core of its activities has vast scope for convergence with various line Departments of Forestry, Soil and Water Conservation, Agriculture, Water Resources, and Community and Rural Development. Successful convergence has been witnessed in the previous mission with MGNREGS scheme of C & RD as well as Tourism Department in our efforts to conserve through Sanctuaries. There is still vast scope for convergence which would be addressed and looked into under MSAM 2.0.

a. **MGNREGS:**

The scope of convergence with MGNREGS is vast and manifold considering that both the Departments concentrate on rural upliftment. There are various water bodies that have been created under the MGNREGs in the rural areas either for water harvesting and/ or other purposes. Adoption of these water bodies (ponds/ tanks) for Aquaculture would be taken up by providing inputs for culture. Convergence with MGNREGS for other schemes such as Community Ponds, Establishment of Sanctuaries in which supporting infrastructure development through Gap Funding can also be explored. Providing inputs to the MGNREGS, water resources and soil conservation ponds will be a key step in this direction.

b. **Central Schemes (National Fisheries Development Board, CIFA, Ministry of Food Processing Industry etc.):**

Technological and schematic convergence with National Organisations and Institutes for Technology induction as well as Schemes which are in line with the Mission's objective would be taken up.CIFA through its induction of the Fibre Re-inforced Plastic Hatcheries have shown that technological convergence in the Mission has been successful. This effort would continue in the MSAM 2.0.Convergence with NFDB for Paddy cum Fish culture for both the technical and financial convergence will be taken us as a apart of the Mission of the Department and the NFDB's Fisheries Development activities. Convergence can extend to introduction of more opportunities of value addition in the Sector along with other Post Harvest Technologies through institutes like CIFRI, CIPHET, CIFT, etc.

c. **Other Schemes / Line Departments:**

Convergence with other line Departments would be in a more gap filling approach. In the activities carried out in MSAM 1.0, successful convergence of the Mission in Mini Mission VI: convergence with Tourism, MGNREGS, and Soil Water Conservation Department were noticed. The efforts for convergence in this component would continue in MSAM 2.0.

Various opportunities and scope for convergence would unfold during the course of implementation of the Mission. Flexibility to promote such convergence would be ensured in the MSAM 2.0

Convergence Fund:

Rs. 10.00 Crore as a corpus fund for convergence activities is earmarked from the Fisheries department under the Mission.

Fish Dale Farm

CHAPTER - IX

Sources of Funding

The total requirement of funds for the five years of implementation of the Meghalaya State Aquaculture Mission 2.0 has been worked out Mini Mission wise and component wise. The possible central share would be mobilised from Centrally Sponsored and Central Sector Schemes of the Ministry of Agriculture and Farmers Welfare. Among others the SPA, State Plan etc. has been the major contributor of funds for driving the implementation of the Mission. Funds would be mobilised for the MSAM 2.0 from these schemes aswell. Funds for similar developmental activities from different schemes will be converged eg. MGNREGS, NEC, IWMP, Blue Revolution, RKVY, KFW (international funding).

a. **RKVY: Rashtriya Krishi Vikas Yojana**

The RashtriyaKrishiVikasYojana implemented through its Nodal Department of Agriculture has been a major scheme from which funds had been mobilised for Fisheries Development. Under this Mission efforts will continue to converge these funds towards achieving the Mission's objective.

b. **Blue Revolution (Neel Kranti)**

The Blue Revolution is an Umbrella Programme of the Integrated Development of Fisheries of the Ministry of Agriculture and Farmers Welfare, Government of India was launched in 2016. This scheme has been a major source of funding to the State for Fisheries Development. Components of the Mission would be closely integrated for funding with the components of the Blue Revolution. Components such as New Pond Construction, Renovation, Post Harvest Infrastructure Development etc would be closely aligned with the guidelines and unit cost of the CSS scheme. As a National Scheme devoted for Fisheries development this CSS : Blue Revolution scheme would form a very important source of funding. This would allow the Mission to not only achieve the State's objectives but also the national objective in the sector.

c. **NFDB (National Fisheries Development Board):**

The NFDB has been a major organisation dedicated for fisheries development in the country since 2006. The State shall continue to mobilise funds for the Mission from the organisation for a more holistic development in the sector.

d. **External/ International Aids:**

Funds for certain components of the Mission such as Mini Mission II: Modern Hygienic / Retail units, Mini Mission II: Establishment of sanctuaries and other gap funding for value addition to the activities of the Mission would be solicited from International organisations viz. KFW, GIZ etc.

TENTATIVE REQUIREMENT OF FUNDS

(Rs. in lakhs)

Sl. No.	Components	Total Investment	Funding		
		For 5 Years	Govt. Assistance	Credit linkage	Beneficiaries contribution
1	**Mini Mission I: Area & Productivity Expansion**				
	Area Expansion through Individual Ponds	16882.50	10129.50	42206.25	25323.75
	Area Expansion through Community Ponds	562.75	337.65	-	225.10
	Paddy Cum Fish Culture	714.00	428.40	-	285.60
	Mini Mission I Total	***18159.25***	***10895.55***	***42206.25***	***25834.45***
2	**Mini Mission II: Critical Infrastructure Development**				
	FRP hatchery	687.65	412.59	171.91	103.15
	a) Feed Mill (medium)	250.00	150.00	62.50	37.50
	b) Feed Mill (small)	500.00	300.00	125.00	75.00
	Modern Hygienic Markets	1000.00	600.00	250.00	150.00
	Retail Units (Mobile/Kiosks)	1000.00	600.00	250.00	150.00
	Transportation				
	a) Insulated Vans	150.00	90.00	37.50	22.50
	b) Refrigerated Trucks	250.00	150.00	62.50	37.50
	c) Oxygenated Vans for live fish	200.00	120.00	50.00	30.00
	Aquatic laboratories	350.00	350.00	-	-
	Diagnostic tools & kits	17.50	17.50	-	-
	Mini Mission II Total	***4405.15***	***2790.09***	***1009.41***	***605.65***
3	**Mini Mission – III Conservation of Indigenous Fisheries Resources**				
	Survey and Study for Conservation and Fisheries Resources	22.00	22.00	-	-
	Awareness Campaigns / Cleaning Drives/ community Mobilisation programmes				
	Awareness Campaigns	37.50	37.50	-	-
	Cleaning Drives	55.00	55.00	-	-
	Community Mobilisation Programmes	122.50	122.50	-	-
	Establishment of fish Sanctuaries:	250.00	250.00	-	-
	Ex Situ Conservation Measures:				
	Setting up of Mahseer Breeding Units	50.00	50.00	-	-
	Indigenous Ornamental conservational units (survey &study	62.50	62.50	-	-
	Mini Mission III Total	***599.50***	***599.50***	***0.00***	***0.00***

Sl. No.	Components	Total Investment	Funding		
		For 5 Years	Govt. Assistance	Credit linkage	Beneficiaries contribution
4	**Mini Mission IV - Capacity Building and Human Resource Development**				
	Capacity building for farmers at MSFR&TI, Mawpun	675.00	675.00		
	Expansion/strengthening of training infrastructure at MSFRTI	310.00	310.00		
	Capacity building for Officers (training & Exposure trip)	100.00	100.00		
	Capacity building of FFDA staff (training & Exposure trip)	40.00	40.00		
	Capacity building for Fish Co-operators	21.00	21.00		
	Orientation training programmes at Districts	66.00	66.00		
	Awards for Fish farmers	51.00	51.00		
	Mini Mission IV Total	***1263.00***	***1263.00***	***0.00***	***0.00***
5	**Mini Mission V - Emerging Opportunities in the Fisheries Sector**				
	Aqua Parks	700.00	700.00		-
	Ornamental Fisheries:				
	Backyard rearing unit	75.00	45.00		30.00
	Medium Scale rearing unit	80.00	48.00		32.00
	Integrated ornamental fish unit	25.00	15.00		10.00
	Input cost for backyard rearing unit	2.00	1.20		0.80
	Input costs for Medium scale rearing unit	12.00	7.20		4.80
	Input costs for integrated ornamental fish unit	2.00	1.20		0.80
	Aquarium fabrication -cum- retail unit	30.00	18.00		12.00
	Input costs for Aquarium fabrication -cum- retail unit	10.00	6.00		4.00
	Capacity building under ornamental fisheries	25.00	25.00		-
	Mini Mission V Total	***961.00***	***866.60***	***0.00***	***94.40***

Sl. No.	Components	Total Investment	Funding		
		For 5 Years	Govt. Assistance	Credit linkage	Beneficiaries contribution
6	**Convergence under MSAM**	**10.00**	**10.00**		
	Total Anticipated Budget for MSAM 2.0	**26,387.90**	**17,047.24**	**5,230.04**	**3,743.13**
7	**Administrative cost @ 5%**	**1,319.40**			
8	**Funds sanctioned for 2018-19 (Centrally Sponsored Scheme)**				
	Blue Revolution 2018-19*	9441.40	5770.50		3670.00
	RashtriyaKrishiVikasYojana – RAFTAAR 2018-19*	626.70	378.70		248.00
	GRAND TOTAL	**37775.395**	**23196.440**	**5230.035**	**7661.125**

TENTATIVE SOURCES OF THE FUNDS

(Rs. in lakhs)

Components	Total Investment required for 5 Year	Funding						
		NFDB	Central Government (Blue Revolution)	State Government (State Share)	RKVY	NEC	FFDA	KFW
Mini Mission I: Area & Productivity Expansion	*18159.25*							
Mini Mission II: Critical Infrastructure Development	*4405.15*							
Mini Mission III: Conservation of Indigenous Fisheries Resources	*599.50*							
Mini Mission IV: Capacity Building and Human Resource Development	*1263.00*							
Mini Mission V: Emerging Opportunities in the Fisheries Sector	*961.00*							
Convergence under MSAM	*1000.00*							
Total Project Cost	**26378.90**							
Administrative Cost at 5% of the Total Project Cost	**1319.40**							
Blue Revolution 2018-19	9441.40							
RKVY – RAFTAAR 2018-19	626.70							
Grand Total	**37775.395**							

CONCLUSION

The Meghalaya State Aquaculture Mission 2.0 endeavours to fulfil the deficiency in the availability of fish taking into consideration the gap in the fish production of 15,000 MT. The Mission strives to achieve the objectives by adopting holistic approach. The projections and target will be met through various Mini Missions. Mini Mission - I emphasises on Area and productivity expansion through individual and community ponds including paddy cum fish culture. Area expansion under individual and community pond targets to cover water area of 1500 hectares and 110 hectares respectively in the span of 5 years, while the figure for paddy -cum- fish culture stands at 340.0 hectares.The area of 1000 Ha.for new ponds construction and other components under Blue Revolution 2018-19 in line with the Mission's objectives will also be inducted as part of the MSAM 2.0.Mini Mission II focuses on the infrastructural development. The component under Mini Mission II includes FRP hatchery, small and medium Feed mill, modern hygienic fish markets, retail units and transportation units such as insulated vans, refrigerated trucks and oxygenated vans for the transport of live fish and aquatic laboratories including diagnostic tools and kits. Attention will be given toward conservation of indigenous and endemic species for sustainable management of wild stock with community participation. Realizing the need for the Identification and stock assessment of existing fish resources through sampling, potential sites for conservation (breeding grounds, natural habitats) rigorous methods of PRA and other tools of sampling are going to be grounded. Capacity building and human resources has been instrumental leading to the success of the MSAM 1.0. So far a total of 5500 Nos. of fish farmers were trained in various aspects of fisheries including skill development at MSFR&TI. Capacity building played a significant role in shaping the attitudes of the farmers thereby leading to the development of fishery sector in the state. The capacity building of farmers including components such as strengthening of training infrastructure at MSFR&TI, Capacity building for Officers (Training & Exposure trip), FFDA staff, fish co-operatives, orientation programmes etc. will be done over the next 5 years. Realising the potential for tapping the resources at disposal, under Mini Mission V, the Department aims to bring into light the large untapped potential and latest trends in the Sector that would promote a more diverse approach in livelihood opportunities, employment and economic upliftment through the sector. The total investment for implementing the various components of the mission has been tentatively worked out to **Rs. 37775.395 Lakhs.**