FISH FARMERS DEVELOPMENT AGENCY
MEGHALAYA

MEGHALAYA STATE AQUACULTURE MISSION

From Dependence to Self-sufficiency

2012-2017

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MESSAGE

The "Integrated Basin Development and Livelihood Promotion Programme" (IBDLPP), the Flagship Programme of the State Government will redefine our developmental investment strategy, opening up windows for new and multifaceted livelihood opportunities under which number of mission mode developmental interventions are being initiated including associated measures – the State Aquaculture Mission is one of the Mission Mode Interventions of this Flagship Programme.

With the release of the Meghalaya State Aquaculture Mission (MSAM) document, an important episode in Meghalaya's developmental history will have begun. The simple yet powerful slogan of the Mission: **'From Dependence to Self-sufficiency'**, captures very eloquently what we seek to achieve through this Mission.

It is an irony of sorts that a state with such high precipitation and large landmass should have an annual fish deficit of more than 15,000 M.T. Any action plan for addressing such a huge demand-supply gap should not just be aggressive, but it would also have to be in a Mission mode. The approach and the attitude of the implementers would have to be very different. As the conventional implementation frameworks of the government will not suffice, a conscious decision has been taken by the Government of Meghalaya to launch the Meghalaya State Aquaculture Mission, to be implemented co-terminus with the 12th Five Year Plan and make the state not just self-sufficient, but even acquire the capability to export fish within and outside the country.

It is my belief that the Mission will not just address the deficit of fresh water table-fish, it will also resolve several of the unemployment issues that are plaguing the rural areas of the state. The ancillary services that will develop through better fish seed and feed supply and proper disease management practices, as also door-step delivery, will productively engage rural people in the fisheries sector on a sustainable basis. As I see it, this Mission has tremendous potential to transform the rural landscape of Meghalaya.

Now that we are commencing the implementation of the Mission, several organizational and managerial challenges will arise and the officials will need to stay the course and move forward with perseverance and fortitude. Though this Mission document is very comprehensive, I visualize new opportunities emerging in the fisheries sector, as we move along. The Mission is supple enough to accommodate emerging opportunities and has the requisite administrative elasticity. This is a Mission and therefore has to be implemented with great speed. I am certain that the Department of Fisheries will gear up to manage this challenge ahead of them. Sustained Government support to the Department of Fisheries to achieve the objective will be ensured. I wish them and the people of Meghalaya great success!

21.02.2012

Dr. Mukul Sangma

Message by the Chief Secretary, Shri W.M.S. Pariat, IAS

It is quite disheartening to note that we are, *per force*, dependent upon other states for even our consumption requirements of table fish. That is despite the fact that our population is small and we have ample water, land and skilled people. Admittedly, one of the major reasons behind the current state of affairs had been the lack of significant investments in the fisheries sector over the years, leading to a negative cycle of inaction and non-performance.

All that however is now past. Now we are looking ahead with great energy and vision to make Meghalaya self sufficient in fresh water fish production and to reduce our dependence on other states. It is however, easier said than done, because the deficit is assessed to be more than 15000 M.T.s and it may take years before we can fulfil our dream. It requires careful planning, systematic execution and great and sustained dedication on the part of the officials of the Fisheries Department. I am happy that the department has a group of dedicated and young officers who are up to the challenge and are raring to prove that their department will be next to none in terms of efficient implementation of the mission.

I know that the Meghalaya State Aquaculture Mission Document has been prepared by following a very rigorous protocol of public consultation and departmental scrutiny. I too had been present in a few such consultation sessions. The fisheries department had been quite open in its approach to solicit suggestions in improving the document at various stages. Despite that, there will still be issues which will have to be resolved at the field level and learned through experience. The document can be suitably adapted in due course of time, by way of executive instructions wherever necessary. That said, the final document has come up well and I compliment the officers who have spent several sleepless hours in going through the fine print and coming up with the final document. I wish them all success in the implementation phase, which quite understandably, is going to be a stupendous task.

I wish the officers of the fisheries department a great success in fulfilling the dream of the people of Meghalaya to become self sufficient in fisheries.

W.M.S. Pariat
Chief Secretary

Meghalaya State Aquaculture Mission

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Executive Summary

Meghalaya with its vast inland fishery resources offers tremendous scope for developing the fisheries sector, but lags behind in harnessing the potential of these natural resources. Though the state is predominantly a fish consuming State, the supply of fish is inadequate to meet its growing demand, making the State import fish from Andhra Pradesh. The Government of Meghalaya has identified fisheries as a key sector and has decided to launch the Meghalaya State Aquaculture Mission (MSAM) co-terminus with the Twelfth Five Year Plan period (2012-13 to 2016-17). The MSAM has the following major objectives:

a) Development of existing water bodies and creation of additional water area for large scale fish production, including reclamation/rehabilitation of marshy and swampy lands,

b) Conservation of native, endangered and traditional species of Meghalaya and developing breeding farms of commercially potential species on a large scale,

c) Creation of mass awareness, capacity building, exposure training and skill development of all the stakeholders and technical support for long term sustainability of fishery sector,

d) Capturing emerging opportunities in the fisheries sector.

Given the wide canvas, the Aquaculture Mission is divided into six Mini Missions for better focus and ease of implementation. Mini Mission I is related to "Area and Productivity Expansion", which will be achieved through four sub components, viz., individual pond construction, community pond construction, development of marshy and swampy areas and bheels and reservoir fishery development. Mini Mission II is for "Critical infrastructure development", which has five components: fish seed production, fish feed production, fish disease management, pre and post harvesting infrastructure and creation and strengthening of fishery and multi-purpose co-operatives. Fish seed production will be achieved through Government and private hatcheries and utilizing FRP technology as also inducting Israeli technology.

Establishing sanctuaries for conserving indigenous and endemic species of fish is the focus of Mini Mission III. Surveys for identifying the endangered species, orientation workshops and media campaigns will be organised under the Mission. The Mission will collaborate with the Department of Tourism for boosting the objectives and targets of the Mission related to Mahaseer and other native species conservation. Mini Mission IV is for "Capacity Building" of farmers as well as officials, programme managers, multi-service providers, co-operators, etc. Mass mobilization campaigns and skill trainings for unemployed youth will be organised under this mini mission. Mini Mission V is titled "Mass media campaigns, documentation and outreach", which will take care of two important activities, viz., awareness building about the Mission and publicity among the public and process documentation of the implementation and preparation of success stories.

Mini Mission VI deals with "Emerging opportunities in the fisheries sector", which is an exclusive visionary component envisaged for tapping the emerging opportunities and addressing them with scientific backstopping. Ornamental fisheries, trout farming, introduction of freshwater prawn culture and new table species of fish and aqua tourism/ aqua parks/ sport fisheries will be the components under this mini mission.

The Aquaculture Mission will have functional convergence with programmes like MGNREGS, RKVY, NRLM, etc and thematic convergence with line departments like Water Resources, Soil and water conservation, Tourism, etc. The Mission proposes to develop a Management Information System vested with the responsibility to collect, store and retrieve relevant and timely information for planning, executing, monitoring and evaluating the Mission. Monitoring and evaluation will be an integral part of the project design, as they provide an opportunity for intervention during implementation and mid-course corrections. The approach of the Mission to engage civil society players can help serve the interests of the people of the state.

The social cost benefit analysis of the various components has been worked out to understand the income gains to farmers, employment gains and other gains to the society at large. The total requirement of funds for the Mission for implementing the various components has also been tentatively worked out and the possible share that could be mobilized from different sources such as RKVY, NFDB, NEC, NCDC, SPA, State Plan, etc has been elaborated.

The successful implementation of the Mission can result in balancing the demand and supply of fish in the state, thus achieving self-sufficiency. There is even possibility for export once the production of fish exceeds demand. The impact of the scheme on employment generation will be quite significant.

The Aquaculture Mission is an integral part of the Integrated Basin Development and Livelihood Programme of the Government of Meghalaya and it is estimated that the investment of about ₹ 1200.00 crore would be required over the 12^{th} Plan Period. The Mission will be launched co-terminus with the 12^{th} Five Year Plan.

Chapter I

Introduction and Objectives

1.1 Introduction

1. India is now the second largest producer of fresh water fish in the world. Fisheries sector occupies an important place in the socio-economic development of the country. It is a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a foreign exchange earner. Most importantly, it is a source of livelihood for 14.49 million economically backward people in the country. The contribution of fisheries to the agricultural GDP as well as overall GDP has been showing a rising trend.

2. Meghalaya with its vast inland fishery resources in the form of rivers, reservoirs, lakes and ponds and an average rainfall of 1200 mm offers tremendous scope for developing the fisheries sector, but lags behind in harnessing the potential of these natural resources. The available land in most parts of Meghalaya is uneven in terrain that makes it somewhat difficult to develop fisheries on commercial lines. However, rain water can be impounded in small ponds for the production of fish and inland fisheries therefore does offer a potential that can be successfully exploited by the people of the state.

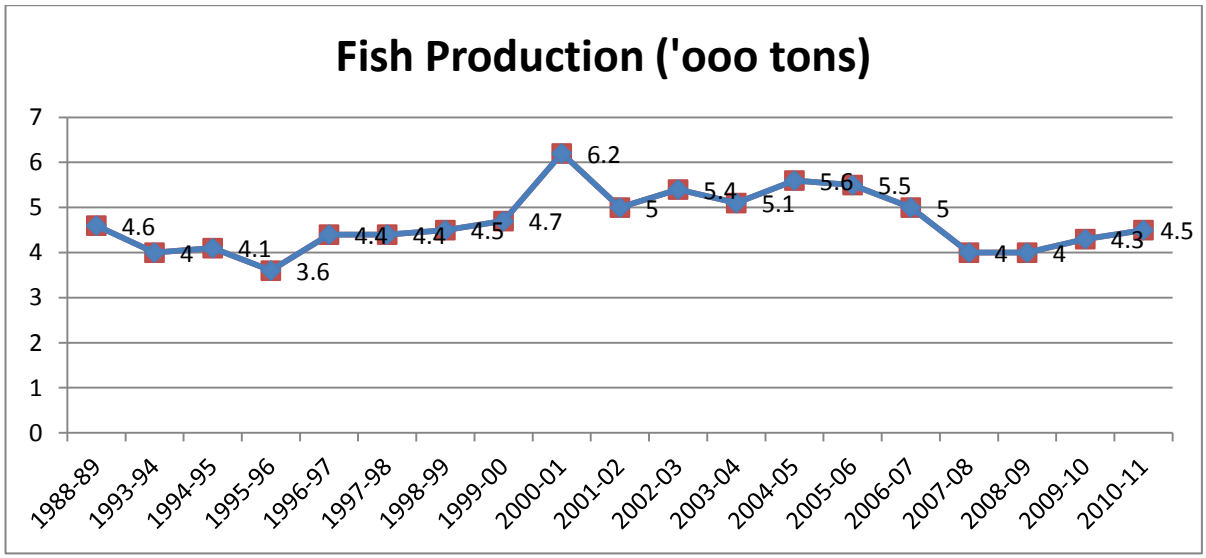
3. Meghalaya is predominantly a fish consuming State, but the supply of fish is inadequate to meet its growing demand in the State. The internal demand for fish far outweighs the supply making the State import fish from Andhra Pradesh. On the other hand, catching of fish in the rivers, lakes, flood prone water bodies, tanks and ponds has always formed the rural livelihoods and a base for food security. Creation of additional water area for fish culture must lead to a transformation in the rural economy and improve the livelihoods of the poor tremendously. To state a little dramatically, neither land, nor water, nor people are in short supply for undertaking the task. The sector only needs public and private investment to flow in.

4. The Government of Meghalaya has identified fisheries as a key sector and decided to assist the people to develop fish ponds. It has decided to launch the Meghalaya State Aquaculture Mission (MSAM) co-terminus with the Twelfth Five Year Plan period (2012-13 to 2016-17). This chapter introduces the subject, after elaborating the status of the fisheries sector in the State. An analysis of the fish production in the State and its contribution to the state agricultural income as well as the Gross State Domestic Product is made. The objectives of the Mission, the demand projections for fish in the Twelfth and Thirteenth Five Year Plan periods are presented and a brief summary and conclusions of the chapter are provided at the end of the chapter.

1.2 Fish Production in Meghalaya

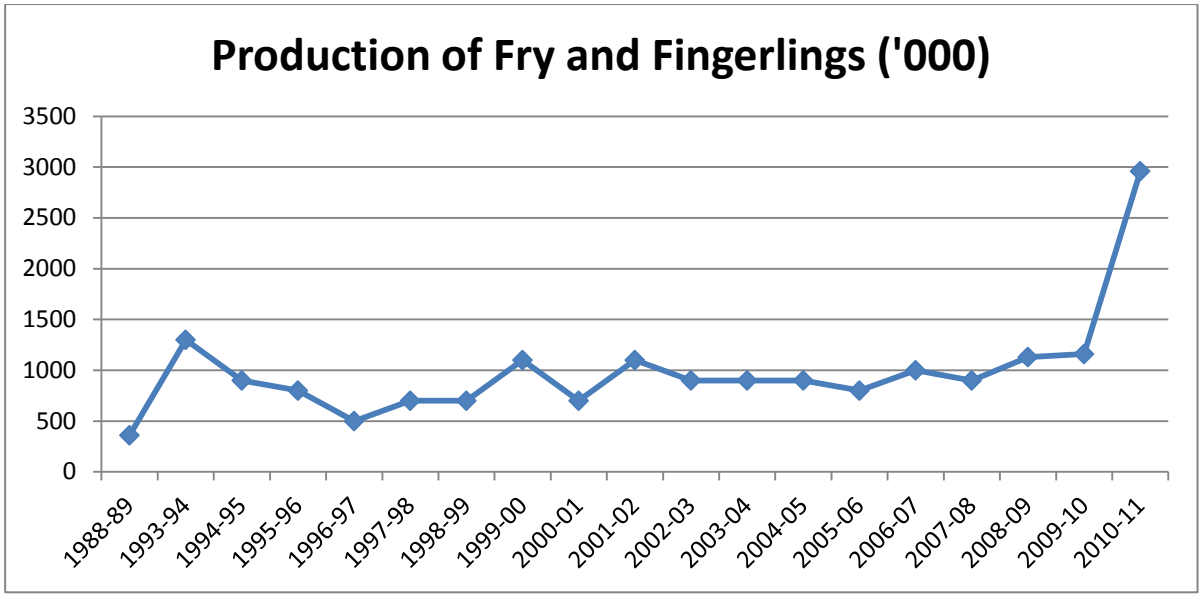
1. The State has great potential for the development of fisheries. The NRSA data reveal that a large extent of area is available for fish production. But there are no firm estimates of the production of fish in the State. The major reason is the absence of any reliable study on the fish production in the State. There are several water bodies in the State, but in the absence of a census, it is difficult to estimate fish production. The solution is to list all the small ponds village-wise with details on the current status of each. The Mission identifies this as one of its activities during the period. The Mission seeks to derive firm estimates of fish production and consumption in the State so that more appropriate choices are made by the planners and policy makers.

2. The available data with all its limitations show that the State produced about 4500 MT of fish during 2010-12. The trends indicate stagnation in fish production since the beginning of 1990s.



3. The production of fingerlings has also not shown any growth except in the last three years. The number of fingerlings produced in the State increased from 10.0 lakh in 2006-07 to 29.6 lakh in 2010-11. This threefold increase in the production of fingerlings in just four years is an indication that the sector is on the process of growth and this has mainly happened due to the financial support provided for the sector Under Rashtriya Krishi Vikas Yojana (RKVY). The impact of this on production and productivity of fish will be felt with a lag.

4. The state has 14 fish seed farms. There has been no increase in the nursery area till 2007-08. However, investments made under RKVY have resulted in some increase in the nursery area. The estimated Bheel and Lake area is 399.6 hectares and water area suitable for composite fish farming is 404.6 hectares. These estimates appear to be on the lower side and reliable data will have to be collected.



5. The State experienced the highest population growth rate among the Indian States (2.5 percent per annum) during 2001-11. As a result of this high population growth and stagnation in production, per capita **availability** of fish within the State has declined. Stagnation in fish production has also resulted in declining contribution of the sector to GSDP from agriculture as well as overall GSDP. The share of fisheries in total agricultural GSDP is only 1.15 per cent as against 5.20 per cent at the national level in the year 2010-11. Its share in GSDP is quite low at 0.21 per cent while the corresponding proportion at the national level is four times higher. The reason for stagnation in fish production in the recent period despite the expansion of area under fish ponds by 500 hectares under the "Thousand Pond Scheme" is not clear. Weak data collection effort on the part of the department could be one of the reasons. As the private ponds are also in remote areas, there has been no systematic effort to collect the data from private fish ponds, and hence it is quite possible that the production figures are a bit suppressed.

6. Data on consumption is more reliable than production data because the former is available from the National Sample Surveys. According to the 61st round of the National Sample Survey pertaining to 2004-05, per capita annual consumption of fish is 6.425 kg per capita in Meghalaya as against 7.096 kg at the national level. If the same level of consumption is considered for 2011, the total consumption in the State is estimated at 19,000 MT. The gap between demand and supply will be about 14,500 MT.

1.3 Objectives of Aquaculture Mission

1. Given the wide gap between demand and supply, the development of fishery sector is a priority item in the planning process of the State Government to exploit the full potential of the sector which would help in increasing the supply as well as ensuring the economic prosperity and livelihood security of the rural poor in the State. Realizing this, the Government of Meghalaya introduced a scheme known as **'Thousand Pond Scheme'** (TPS)

in 2005. This innovative scheme with very limited investments has brought in about 500 hectares of additional water area under fisheries and provided assistance to 2,336 fish farmers over a six year period. A credit of ₹ 17 crore had been advanced to the farmers through this scheme. A small beginning had been made, though the scheme did not provide for any forward and backward linkages. Even when the scheme could be termed as a success, the impact of the TPS had been limited basically because it was implemented in a schematic mode and therefore, the implementation process was very laborious and time-taking. Some of the components of the typical schematic approach of the TPS needed to be addressed urgently, so as to make it a dynamic scheme. Even better, if the whole scheme itself is revamped and launched in a Mission mode, it will likely be faster and better, as more appropriate technology and knowledge has since entered into the fisheries domain.

2. The Government of Meghalaya has now decided to scale it up several fold and implement the intervention in a mission mode, to be known as the **'Meghalaya State Aquaculture Mission' (MSAM).** Enhancement of fish production is possible in two ways – enhancement of the productivity of the existing water bodies, and construction of new ponds. The latter requires the initiative of small land holders whose land is suitable for construction of fish ponds. The present extent of land under fish ponds is estimated to be about 2500 hectares, there is a need to expand it manifold.

3. The MSAM has the following objectives:
   a. Development of existing water bodies and creation of additional water area for large scale fish production.
   b. Reclamation/rehabilitation of marshy and swampy lands and *Bheels* and other water area and developing them into modern fish production system.
   c. Creation of mass awareness, capacity building, exposure training and skill development of all the stakeholders, for long term sustainability of fishery sector.
   d. Conservation of native, endangered and traditional species (Mahseer and Chocolate Mahseer) of Meghalaya and developing breeding farms of commercially potential species on a large scale.
   e. Introduce and promote ornamental fisheries as also diversify the current range, so as to capture several emerging opportunities in the aquaculture sector viz., fresh water scampi culture, etc.
   f. Enhancement of water storage capacity through development of small water areas and microclimate to sustain agricultural production and
   g. Extend all technical support at the door step of the stakeholders.

4. Given the wide canvass of the Mission, Mini-missions and components will be formed to narrow down and focus on particular aspects of the Mission. Mini Mission-I is "Area and Productivity Expansion", which will be achieved through four sub components. Component-I is "Individual Pond Construction", which is crucial because it has implications not only on production enhancement but also for poverty alleviation, employment generation and provision of nutritional security. All the persons who are interested to take up fishing and have land of at least 0.1 hectare or 1000 square meters will be provided financial support in terms of assistance and loan for the construction of pond and maintenance in the first year.

5. Component II is the "Community Pond Construction". This component emphasizes on collective action and technology adoption. Economies of scale in fish production can be realized in this component because each community pond will have at least a size of two hectares. The people in Meghalaya have strong community bonds and participate in cooperative management of community resources. The State has a large number of community fish ponds on common lands. There are still a large number of water bodies on common lands. Development of these water bodies can enhance fish production. There will be a difference in the support for individual ponds and community ponds in two respects. The minimum area for a community pond has to be 0.5 ha. Secondly, financial support for these ponds will be at a lower rate as the community is expected to provide a few services on its own. Since individual ponds are managed by the poor people, governmental support will be provided to a higher extent.

6. Component III is the development of marshy and swampy areas and *Bheels*. This is important because it helps in utilizing the existing unutilized land and water resources in the form of low lying areas. Capital as well as input requirement will be low and return will be high in the development of these areas. This Component has great significance because these areas are idle and they cannot be used for any other purpose. It will improve the ground water potential at a low cost. At present some of these areas are not capable of holding much water because of the growth of wild plants and bushes, erosion and leakages.

7. Component IV is "Reservoir Fishery Development". This Component is very efficient because it does not require any capital investment. The implementation of this Component requires convergence. Barring the first Component, all the other three require collective action and cooperative spirit.

8. Though a lot of fishing activity is going on in the State, the economic model is one of low inputs and low output. Further, in the absence of development of proper market for the inputs, farmers have to *per force* depend upon other States for seed which is resulting in heavy mortality. The poor quality of seed combined with low feed results in low growth of fish. The average weight of fish is only 0.3 and 0.4 kg in the State as against 1 to 2 kg in other states.

9. Mini-Mission II is "Critical Infrastructure Development" and precisely addresses the issues highlighted above. It has seven Components. "Fish Seed Production" component deals with development of hatcheries and fish seed production as per the requirement of the farmers. Hatcheries will be developed under public sector and/or public and private partnership (PPP). "Fish Feed Production" component deals with setting up of feed mills and/or procuring quality feed at a low price from other areas. "Disease Management" component analyzes the diseases pattern and mortality of the seed supplied and suggests remedial measures. "Soil and Water Testing" component focusses on the variation in the growth of fish and its relationship with the quality of water, soil and climate. This component also has the agenda of suggesting the fish seed varieties suitable for the climate and experiences of progressive fish farmers. "Post-harvest Management" component will examine the marketing needs of the fish farmers and provision of suitable infrastructure. The value chain management and processing activities will also be examined under this component. Strengthening of fishery cooperatives will be the focus of a separate component known as "Fisheries Cooperatives".

10. This Mini-Mission is highly important as it can help in breaking the vicious cycle of low inputs and low productivity. When the fish seed is not available at close vicinity and even the available feed is of is of poor quality, there will be high mortality. This high mortality will lead to low and poor quality feeding. The result of poor feeding is low growth and low weight, not exceeding 0.4 kg per fish.

11. Establishment of sanctuaries and conservation of indigenous and endemic species is the focus of Mini-Mission III. The condition of existing sanctuaries will be studied and improvement of the existing ones and development of the new ones is the goal of this Mini-Mission.

12. The most important aspect for the success of MSAM is capacity building of farmers as well as officials, multi-service providers, co-operators etc. Mass mobilization campaigns are needed to build awareness among the people about the opportunities available for them. Mini-Mission IV, known as "Capacity Building", is intended for this.

13. Two aspects of the Mission are critical for its success – awareness building among the masses and documentation of the success stories. These two require continuous effort in terms of media campaigns and publicity though posters, pamphlets, wall writings and cultural programmes. All these activities come under the purview of Mini Mission-V, known as "Mass Media Campaigns, Documentation and Outreach".

14. Since the Mission aims at huge interventions distributed over five years, there is need for strict concurrent evaluation and mid-term corrections wherever needed. The programme will be flexible to accommodate mid-course corrections. A comprehensive report will be prepared every year after a systematic end of the year evaluations and necessary changes will be incorporated in the Mission document in the form of executive instructions.

15. The fisheries sector in the State is operated on traditional lines and is not exposed to the emerging opportunities. When surplus is generated and export opportunities are sought for, modernization and exploring other emerging opportunities play a very important role. Mini Mission-VI, "Emerging Opportunities in the Fisheries Sector" will focus on the new opportunities that can be availed by the sector. Several opportunities like development of ornamental/aquarium fish, trout farming, fresh water prawn/scampi culture are emerging in the sector. Building up entrepreneurship in these areas is the focus of this component. It is also important to develop aqua tourism and aqua parks and organize fish *melas*. These activities will help in bringing awareness among the fish farmers about the emerging opportunities.

1.4 Demand Projections

1. When a massive investment is planned for the development of a sector, it is customary to examine the internal demand and the need for export of the surplus. Per capita demand for a commodity depends on the price of the commodity, prices of other substitutes and complements and income. Total demand is determined by per capita demand and population. It is common to treat relative prices as constant in long term demand projections and treat demand as a function of population and income. Demand projections are made in two steps. In the first step, growth rate of demand will be projected. Applying this growth rate to the base year consumption, demand for the selected years will be projected in the next step. Data for projecting the demand are shown in Table 1.1.

Table 1.1: Assumptions for demand projections

	Twelfth Five Year Plan	Thirteenth Five Year Plan
Growth rate of per capita expenditure	6.00	6.00
Income elasticity of demand	1.15	1.15
Growth rate of population	2.20	2.10
Growth rate of demand	9.10	9.00

2. Base year consumption is the most crucial information in demand projections. The data on per capita consumption is available only from the NSS consumer expenditure surveys. As per the 61st NSS data pertaining to 2004-05 monthly per capita consumption of fish is 528gm. Annual consumption comes to 6.425 kg per capita. This is lower than the per capita consumption at the national level which stands at 7.096 kg. As it is difficult to adjust it to 2012, the same level of consumption is taken as the per capita consumption in the base year. The total consumption comes to 19,528 MT in 2012. The demand for 2017 is estimated at 30,184 MT. This implies an increase of 12281 MT by the end of the Twelfth Five Year Plan and 19,769 MT by the end of the Thirteenth Five Year Plan.

3. The additional area to be developed to meet the demand comes to about 4440 hectares. The initial shortage of 15,000 MT can be met by expansion of 6,250 hectares. Thus, area expansion needed to become self sufficient by the end of the Twelfth Plan is 10690 hectares. If the productivity also improves to 3.0 MT from the present 2.4 MT, the required area expansion comes to 6480 hectares. In the thirteenth Plan period, there is a need to expand area by another 2334 hectares of the same productivity of 2.4 MT/ha continues and 1867 hectares if productivity rises to 3.0 MT/hectare which is very small as compared to the area expansion in the Twelfth Plan. Thus, there is no need to make serious efforts in the Thirteenth Plan to focus on the productivity if the present Mission succeeds in balancing the demand and supply by the end of the Twelfth Plan.

Table 1.2: Projected demand for fish by end of 12th and 13th plans

Year	Consumption (MT)	Increase in Demand (MT)	Expansion* Needed (ha.)	Expansion** Needed (ha.)
2012	19528	-	-	-
2017	30184	10656	4440	3552
2022	46442	16258	6774	5419

*Based 2.4 MT/ hectare **Based on 3.0 MT/hectare.

1.5 Summary and Conclusions

1. The State of Meghalaya has great scope for the development of fisheries because of the heavy precipitation and presence of several water bodies. But the development of these resources needs huge investment in the form of construction of ponds and development of water bodies. There is a need for government support for the development of these resources. The Aquaculture Mission is being launched to transform the fisheries sector in the Twelfth Plan period and provide employment, incomes and nutritional security to the people. The huge import of fish into the State leads to loss of income and employment in the area.

2. The available data on the sector is quite scanty and there is a need for strengthening the data base. An inventory of existing water bodies and their condition has to be prepared and sample survey has to be conducted for understanding the problems.

3. The existing data shows that per capita availability of fish declined from 201 kg to 105 kg during the last decade because of the stagnation in production and high population growth. The sector has a negligible contribution to the GSDP as well as agricultural income. The demand projections indicate that there is a need for the expansion of 5000 hectares to meet the additional demand in the Twelfth Plan period and 6000 hectares to fill the existing gap between demand and supply. However, development of existing water bodies and improving the productivity will help in reducing the required area development to meet the internal demand.

4. The MSAM of the Government of Meghalaya being launched coterminous with the Twelfth Five Year Plan has three broad goals: The first is the expansion of fish production. This will be achieved in two ways – area expansion and development of existing water bodies. The poor will be given priority in the area expansion scheme by providing adequate financial support for the construction of individual ponds. Community ponds will also be encouraged to strengthen the unity among village communities. The various water bodies in the form of reservoirs, marshy and swampy areas and *Bheels* will be used for fish culture. The second goal of the Mission is strengthening the forward and backward linkages through the development of seed and feed production and marketing infrastructure. Hatcheries will be developed both under public sector and public and private partnership. The third aspect of the Mission is the conservation of indigenous endemic species. The fourth and the most crucial aspect is human resource development. All the prospective farmers will be exposed to fish production and the selected beneficiaries will be provided intensive training. Besides this, all the officers will be trained in new technologies adopted in other places. This aspect has strong linkage with productivity improvement. An important aspect is the monitoring and evaluation of the Mission activities along with the Management Information System, to help obtain the data in real-time. The experience of each year will be used to make mid-term corrections in the next year wherever needed.

Chapter II

Approach of the Mission

As stated during the chapter I, the Aquaculture Mission is divided into six Mini Missions, (abbreviated in the document as MM) for better focus and ease of implementation. The Mission is proposed to be implemented under six mini-missions, each of which is detailed below:

2.1 Mini Mission I: Area and Productivity Expansion

1. The Department of Fisheries launched the "1000 Pond Scheme" during 2005-06 to bring in more area under fisheries, which had resulted in the creation of an additional 500 hectares of water area in the state. 2336 individuals became fish farmers through that scheme and are now engaged in the production process. The growth that happened through the scheme not being sufficient, it has been decided to make a much larger investment through Aquaculture Mission. The Mission envisages the creation of a water area of 10,000 ha within a period of five years at the individual level in addition to the reclamation of marshy areas and development of community water bodies. Adopting a cluster approach for area expansion and development of fishery clusters will be one of the approaches to be adopted.

2. Marshy and swampy areas, *Bheels* and other community water bodies will be reclaimed and stocked with good quality fish seed. It is visualized that upto 500 hectares of such community water bodies could be developed under the Mission. As reservoirs are an important source for increasing fish production, the Mission will also improve the productivity of the three known reservoirs of the state (Umiam, Kyrdemkulai and Nongmahir) by stocking with high quality fish seed to enhance the fish production in the state. Similarly, the Mission will make the lakes and other small water bodies productive by stocking with quality fish seeds. In nutshell, wherever there is potential for fisheries, the Mission will strive to make the assets productive.

2.2 Mini Mission II: Critical Infrastructure Development

1. Seed and feed are two critical components for inland fish farming. The Mission will address the problem of shortage of quality fish seed by establishing modern hatcheries and upgrading the existing Departmental fish farms. The government hatcheries in the seven districts will be upgraded to meet the demand for fish seed. Wherever possible, the hatcheries will be privatized for higher and better fish seed production as well as for generating revenues for the state exchequer. Setting up of FRP portable hatcheries will be one of the key small scale interventions of the Mission, to get quality seed in a decentralized approach. The Mission will also address the problem of high cost and non-availability of fish feed by setting up small scale fish feed mills in the private sector, technology for which will be appropriately sourced.

2. The aquaculture technology developed in Israel for large scale production of seed of the cultured organisms (fish fry) will be adopted. The Mawpun Fish Farm will be upgraded further, by adopting Israeli technology. The Mission will provide technical support and advisory services for management of fish diseases. Disease is one of the major problems associated with aquaculture, which has become a limiting factor in enhancement of fish production. Fish become susceptible to various infectious organisms such as Protozoa, Helminths, Bacteria, Fungi and Virus. Therefore, it is essential to adopt suitable health management measures to reduce the loss due to disease outbreaks in culture systems. Through the Mission, the research wing of the Department of Fisheries at Mawpun will be upgraded and equipped with essential instruments and technologies like PCR for diagnosis of infectious diseases and recommending prophylactic measures. Procurement and supply of necessary equipments like kits for water-soil analysis, Drag-nets, Happas, Hand-nets, etc will form the other key activities under the Mission.

3. The Mission proposes to upgrade the existing fish markets and also construct modern fish markets in scientific lines, with necessary facilities. Through the Aquaculture Mission, the existing Fishery Co-operative societies in the state will also be strengthened by extending financial and technical support to help the fish farmers, and to further enhance fish production. Institution building within the fishery sector is of high priority but as the process of creating new institutions will take time, it is felt necessary to take stock of the existing institutional base and strengthen it immediately in the short term. New institutional structures, by way of district level and state level fish farmers' collectives would be supported.

2.3 Mini Mission III: Conservation of indigenous fish

1. Establishing sanctuaries for conserving indigenous and endemic species of fish is a key component of the Mission. Conservation is considered important due to various reasons. Firstly, the indigenous species are the wealth of the state and hence they have to be conserved, secondly they have future commercial value and emerge as unique food material, thirdly they are potential genetic material from the point of view of bio-diversity and lastly they may form a source of livelihood for many fishers. Several measures for conservation will be adopted by the Mission, key ones being the launching of Media campaigns, orientation workshops for the fish farmers, awareness campaigns for school and college students, educational camps, etc. Steps will be taken under the Mission to draft and implement a legislation to conserve and protect indigenous species of fish. The Meghalaya Fisheries Act will be put in place.

2. The importance of Mahseer as a sport fish is well known and it will be declared as the State fish. For evolving a sound rehabilitation policy for Mahseer water bodies, detailed surveys will be conducted utilizing the services of Programme Managers in collaboration with the

district officials of the Department of Fisheries. There will be check on unregulated fishing and selected Mahseer water bodies will be developed where rods and lines only will be allowed to operate. The existing Mahseer sanctuaries in various locations will be protected, and will be developed as tourist destinations. The Mission will collaborate with the Department of Tourism for boosting the objectives and target of the Mission related to Mahseer conservation.

2.4 Mini Mission IV: Capacity building and HRD

1. The successful implementation of the Mission is critically dependent upon the capacities of all stakeholders. Besides the service personnel, fish farmers, Multi service providers and co-operators will also be provided technical training. Creation of the capacity building infrastructure will be given due importance under the Mission. It is also proposed to organize skill trainings for unemployed youth in hatchery management, ornamental fish production and setting up of aquarium fabrication units. Mass mobilization campaigns for enrolling potential fish farmers in the Mission will be organized in all districts of the state.

2. The Mission proposes to establish seven Training Centres (one in each district) with adequate facilities for training, as part of its effort to create the Capacity building infrastructure. Each of these training centres would be fully equipped, with sufficient capacities to train the farmers and the officers.

3. The Aquaculture Mission will be implemented in Meghalaya during 12^{th} plan period by the Fish Farmer Development Agency (FFDA). For effective functioning of the Mission and to ensure its success, the organisational set up of FFDA would be strengthened. FFDA will function as a body with a Mission Director and requisite supporting staff. Technically qualified Programme Managers will be appointed on contractual basis for reaching out to the farmers. They will be supported by the Multi Service Providers (MSPs) who are also appointed on contractual basis for the Mission in order to provide various services to the farmers. They should have passed Class 12 and will be given hands on training on the required skill sets.

4. The Mission will work in a phased manner. During the first year of implementation, the target fixed would be low, which will gradually increase in the subsequent years, as the institutional capacities to achieve the targets improve, along with the streamlining of the processes. The targets would be achieved by the end of the fifth year. Under the Mission, it is proposed to institutionalize awards/incentives for the best performing fish farmers and fishery officers to motivate them for higher performance.

2.5 Mini Mission V: Mass Media Campaign, Documentation and Outreach

The Mission can succeed only if there is greater participation of the fish farmers in various activities envisaged. To create awareness about the Mission and its activities and give wide

publicity among the public at large and the fish farmers in particular, campaigns utilizing the mass media (print and electronic) will be organized. The process documentation of the implementation of the project and preparation of success stories and its wide dissemination through the media will also form an important component of the Mission. Mini Mission V intends to provide boost to the mass media campaigns and documentation in a big way. Workshops, seminars, fish melas, fish festivals, exhibitions, etc will be organized to popularize and publicize the essence of the Aquaculture Mission to the public. Press releases, press conferences, broadcast/telecast through local cable networks, etc will be used to reach out to the public. FM radio would be used extensively for reaching out. Promotional and publicity materials like pamphlets, leaflets, booklets, technical bulletins, etc will be published in local language and distributed to the public, and educational films will also be made.

2.6 Mini Mission VI: Emerging opportunities in the fisheries sector

1. There is an exclusive visionary component envisaged under the Mission for tapping the emerging opportunities in the fisheries sector, and addressing them with utmost seriousness and scientific backstopping. There is immense potential for breeding and rearing of ornamental/aquarium fish. It is reported that the state has about 256 species of indigenous ornamental fish species which are easy to culture and breed in a commercial way. The agro-climatic conditions of the state are very congenial for cold water aquaculture. There is potential for trout farming in the state, which has to be fully exploited. The potential for freshwater prawn culture has also to be further exploited. Freshwater prawn (*Macrobrachium malcolmsonii*) is a compatible species for polyculture along with Indian major carps.

2. The people of Meghalaya are known to be sport lovers and angling is one of their favourite sports. Under the Mission, appropriate sites and structures of water bodies will be identified and developed as angling pockets for promoting sports fish and aqua/eco-tourism. It is reported that the Sajar Nangli Fishing Festival organised at Thadlaskein lake near Jowai in Jaintia Hills during 2010 had attracted a huge crowd from different places in the country The Mission will also promote organization of Fishery festivals in similar lines at different locations to attract tourists and disseminate the theme of Aquaculture mission.

3. The Mission will initiate freshwater prawn/scampi culture in the state. Establishment of aqua parks that display various types of fish in natural bodies developed in a meandering way with passages will be another activity, which will have entertainment and educational value for the students. The Mission will also strive for introduction and popularization of new table species of fish. Table trout and two German phenotypes of common carp (mirror carp and scale carp) will be introduced.

4. The Rombagre Fish Sanctuary in West Garo Hills and the Nongbareh Fish Sanctuary in Jaintia Hills have become popular tourist destination in the state. In line with these, the Mission proposes to transform a few other fish sanctuaries also as tourist destinations.

2.7 Other activities under the Mission:

1. Convergence

It is expected that convergence of inter-sectoral programmes with State Aquaculture Mission will enable better planning and effective investment in the fisheries sector. Convergence also brings synergy between different government programmes and/ or schemes in terms of their planning, process and implementation. It also helps in avoiding the duplication of efforts by different agencies and thus helps in optimally deploying resources. Convergence will also help to integrate relevant technologies with the Mission. The Aquaculture Mission will have functional convergence with programmes like MGNREGS, RKVY, NRLM, etc. and thematic convergence with line departments like Water Resources department, Soil and water conservation, Tourism.

An example of successful convergence is in Nongbareh village in Jaintia Hills, where a small check dam constructed by the Soil and water conservation department/ Water Resources department has been declared as a Fish Sanctuary by the people of the village. The endangered chocolate Mahseer species is also being conserved and has now populated the entire stretch of the river. The Mission will attempt to replicate such interventions in other rivers, streams of the state.

2. Management Information System (MIS)

There is need for developing a data generation and interpretation system to provide instant information and credible and accurate data relating to all the components of the Mission. The Mission proposes to develop a Management Information System (MIS) vested with the responsibility to collect all the relevant data including details of water bodies, details of beneficiaries, financial details, etc.

Technically qualified personnel would be engaged for developing the MIS. The data entry would be on on-line mode. A website will be designed and hosted for uploading the data and information relating to the various components of the Mission would be provided to the stakeholders promptly.

3. Monitoring and Evaluation and Social Audit

The progress of implementation of the various components under the Mission will be monitored regularly. Monthly progress reports, quarterly progress reports and half yearly reports in the prescribed formats sent by the implementing officials will be reviewed and mid-course corrections in implementation will be made, wherever necessary.

There will be a mid-term evaluation of the Mission conducted by an external agency at the end of the second year, which will be selected, based on competitive bidding. The findings of the mid-term evaluation will be used for modifications/refinements in the implementation of the Mission during the subsequent periods. There will also be an end-term evaluation of the

Mission, which will capture the tangible and intangible benefits to the fish farmers developed through the Mission. The impact of the various components of the Mission in relation to income gains, employment gains and contribution towards the State Domestic Product will also be analysed.

Social audit will be employed to monitor the progress of the Mission in the field. Social audit is a process in which the details of the resources, both physical and financial, used by the public agencies for the development initiatives are shared with the people, often through a public platform. It allows people to enforce transparency and accountability, thereby providing the ultimate users an opportunity to scrutinize the development initiatives. It is proposed under the Mission to create a social audit team involving beneficiaries of the programme, civil society members, media personnel and reputed persons in the society to ensure transparency and accountability of the programme.

4. Social Cost Benefit Analysis:

The social cost benefit analysis of the various components will be worked out to understand the income gains to farmers, employment gains and other gains to the society. Various measures of project performance will be employed to study the direct and indirect benefits of the Mission. The impact of the Mission on the State Domestic Product (SDP) will be studied based on the data generated from MIS and monitoring reports.

5. Sourcing of funds and management

The total requirement of funds for the Mission for implementing the various components of the Mission has been worked out. The possible share that could be mobilized from different sources such as Ministry of Agriculture (RKVY), NFDB, NEC, NCDC, SPA, State Plan, etc has been elaborated. Institutional credit support through the Meghalaya Co-operative Apex Bank and the possible funding through other multi-lateral institutions will also be tapped.

Chapter III

Mini Mission - I

Area and Productivity Expansion

Introduction

Private Fishery Ponds at Mawlyngngai Village (Ri-Bhoi District)

Expansion of fish production in the State to fill the wide and growing gap between demand and supply is the central focus of the Meghalaya State Aquaculture Mission. Demand projections indicate that the demand for fish will grow at an annual rate of 9.0 to 10.0 percent in the Twelfth and Thirteenth Plan periods. Area and Productivity Expansion Mini-Mission (MM-I) seeks to address this issue. It has two components – one is construction of new ponds, known as Area Expansion, and the other is availing the existing water resources for fish culture, known as Production Intensification.

Construction of new ponds will be taken up mostly on the individual lands. But some ponds will also be constructed on community lands if the community comes forward with land and also makes some contribution in the construction of pond by way of labour. Meghalaya has a large body of community lands and the recent experience shows that fish ponds constructed on the village common lands are successful in achieving socio-economic development of the village, as also in harmonising the village communities.

The State has several water bodies called marshy and swampy lands and bheels which are under the control of the community. Fish production can be taken up in these lands if the community contributes their share in renovation and is also willing to maintain it afterwards. The State has also several water bodies in the form of reservoirs and lakes. While the water is primarily used for agriculture, it can also be used for the production of fish. These two production activities will intensify production on existing water bodies and hence improve the productivity of the water bodies. The MM-I will utilise all these possibilities of production expansion. The activities of the MM-I can be divided into four sub-components:

1. Construction of individual ponds
2. Construction of community ponds
3. Reclamation of swampy lands, marshy lands and bheels
4. Development of Fisheries on reservoirs and lakes

This chapter is devoted to elaborate the four activities of the Mini-Mission I. The chapter is organized in eight sections. Section II and Section III focus on the Individual and community ponds respectively. These two activities are oriented towards livelihood and poverty alleviation. While the component of community ponds also has the same impact as that of the individual ponds, it differs in terms of the scale as well as financial support extended by the State. Section IV is devoted for development of fisheries in swampy and marshy lands and bheels and Section V for development of fisheries in reservoirs and lakes. These two activities will expand fish production in the existing water area. In other words, expansion of production is achieved through productivity improvement. The total cost of each of these four components of the Mini – Mission in different years is discussed in Section VI. The total cost will be shared by the Government of Meghalaya in the form of assistance, the commercial banks in the form of loan and the community/individual contribution. The shares of these three stakeholders are also discussed in this section. The impact of the Mini Mission on increase in production from each of the four components is elaborated in Section VII. The summary and conclusions of the chapter are highlighted in Section VIII.

3.1 Construction of Individual Fish Ponds

Private Fishery Pond at Smit Village (East Khasi Hills District)

The main purpose of this activity is to utilise idle land, water and labour resources to provide supplementary income and employment to the rural poor along with nutritional security, and production enhancement. The Mission intends to expand area under fish ponds by 10,000 hectares in five years on the lands of one lakh farmers.

1. Yearly Targets

The first issue is yearly phasing of the targeted area of 10,000 hectares. It is appropriate to phase it in a graduated manner as several organisational and implementation issues will have to be sorted out in the initial years. Further, implementation becomes easy and smooth with experience. Yearly targets are fixed keeping these two aspects in mind. The target for the first year is kept at 1500 hectares and will go up to 2400 hectares in the fifth year. The coverage of area in different years is shown in Table 3.1.

Table 3.1: Year-wise Targets for Construction of Individual Ponds

S. No.	Year	Area Expansion under Individual Ponds (Ha.)
1.	2012-13	1500
2.	2013-14	1800
3.	2014-15	2000
4.	2015-16	2300
5.	2016-17	2400
Total		**10,000**

The allocation of the targeted area has to be based on the potential for development of aquaculture. Due to the wide differences in climatic conditions, topography and water resources, the potential varies across districts and C&RD blocks. Table 3.2 shows the distribution of area across districts. Out of the 10,000 hectares of the targeted area, 58.1 percent (5810 hectares) is allocated to the Garo region which covers 36.4 percent of the geographical area and 37.5 percent of the population of the State. On the other hand, the Khasi-Jaintia region, with 63.6 percent of the geographical area and 62.5 percent of the population has been allotted 41.9 percent of the total targeted area.

There are differences in the allocation even within each region. Jaintia Hills district has got 21.0 percent of the area allocated for the four districts. East Khasi Hills and West Khasi Hills have been allotted 28.2 and 24.5 percent of the targeted area of the region respectively. In the Garo region, West Garo Hills district has got a very high allocation of 54.4 percent of the region's targeted area. East Garo Hills has got 23.9 percent and South Garo Hills 21.7 percent. West Garo Hills occupies a very important place with a share of nearly one-third of the targeted area of the State. The allocation of area to different blocks in a district is also based on the potential in various areas of the district. The allocations of area for different C&RD Blocks are shown in Appendix 3.1.

Table 3.2: Distribution of Individual Pond Area by Districts

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total	Percentage
Jaintia Hills	133	158	176	202	211	880	21.0
East Khasi Hills	179	213	236	270	282	1180	28.2
Ri-Bhoi	165	199	217	254	265	1100	26.3
West Khasi Hills	155	185	205	237	248	1030	24.5
Khasi-Jaintia Region	**632**	**755**	**834**	**963**	**1006**	**4190**	**100.0 (41.9)**

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total	Percentage
West Garo Hills	471	568	636	728	757	3160	54.4
East Garo Hills	207	250	279	319	335	1390	23.9
South Garo Hills	190	227	251	290	302	1260	21.7
Garo Region	**868**	**1045**	**1166**	**1337**	**1394**	**5810**	**100.0 (58.1)**
State	**1500**	**1800**	**2000**	**2300**	**2400**	**10000**	

Figures in the parentheses are regions' percentage shares.

2. Cost of Construction

Cost of construction of a pond depends on the size of the pond, which again depends on the availability of suitable land. Both availability and the terrain of the land determine the size of the pond. The size of the pond that can be constructed on the land of a marginal farmer is likely to be small. The experience of the "Thousand Ponds Scheme" showed that 0.2 hectare as the minimum water area is on the higher side for a marginal farmer and needs a downward revision to 0.1 hectare. If a higher minimum is prescribed, many poor people desiring to have a pond become ineligible. Hence the size of the pond is fixed at 0.1 hectare.

Earth work is the major component in the construction of a pond and it is estimated that 600 man days are needed to dig a pond of 0.1 hectare area to a depth of 1.5 m. At the MGNREGS wage rate of ₹ 117/- per day, the cost of earth work is estimated at ₹ 70200/-. With the inclusion of other items needed for the pond, the total capital cost of construction comes to at ₹ 71700/-.

The recurring costs consist of seed, feed, health care, human labour for harvesting, besides lime, dung, chemical fertilizer and fishing equipment. The requirement of seed is estimated at 1000 fingerlings and that of feed at 150 kg per 0.1 hectare. The total recurring cost comes to ₹ 11950/-.

In addition to the recurring cost for the first year, the cost of feeding in the second and third years will also be included in the project cost to help the farmers in stabilizing their income for three years as they have to repay the loan. There are some other costs like processing fee, insurance, transporting inputs and sign board to be incurred by the farmer. These costs will also be included in the project cost so that the burden on the farmers will be reduced. The total cost of these items is designated as additional support. The total of the three components of the project cost namely, cost of construction, cost of inputs and cost of additional support, comes to ₹ 90,400/-.

It is a well known fact that cost of construction increases year by year due to inflation. The project takes care of this problem. Since labour cost is the only item in the construction of a pond, capital cost will be revised from second year onwards with revisions in the MGNREGS

wage rate. This is necessary to make the project realistic and affordable to the farmers. The scheme envisages a back-ended assistance of 60 percent and a loan of 25 percent of the total cost. The remaining 15 percent will be the contribution of the farmer. The assistance and loan components amount to ₹ 54000/- and ₹ 22500/- respectively. The details are given in Table 3.3.

Table 3.3: Cost and Assistance Components of Individual Fish Pond Scheme

Item	**Specification**	**Value (₹)**
Area of the Pond (m^2)	1000	-
Depth of the Pond (m)	1.5	-
Volume of the Pond (m^3)	1500	-
Earth work per worker per day (m^3)	2.5	-
Labour days for excavation	600	-
Wage rate per day (₹)	117	-
Total wage cost for excavation (₹)	600 x 117	70200
A.C pipes	4 Nos.	1500
A. Capital Expenditure		**71700**
Lime 100 kg @ ₹ 12/-	100 x 12	1200
Dung 1000 kg @ ₹ 1/-	1000 x 1	1000
Super phosphate 20 kg @ ₹ 8/-	20 x 8	160
Urea 20 kg @ ₹ 8/-	20 x 8	160
IMC and Exotic Carp fingerlings (No.)	1000	2000
Rice bran 75 kg @ ₹ 15/-	75 x 15	1125
Oil cake 75 kg @ ₹ 20/-	75 x 20	1500
Health Care	L/S	400
Fishing equipment	L/S	3000
Labour 12 man-days @ ₹ 117/- per day	12 x 117	1404
B. Input Cost		**11949**
Second Year feed		2625
Third year feed		2625
Processing fee		200
Sign Board		450
Insurance		450
Door step delivery		400
C. Additional Support		**6750**

Item	Specification	Value (₹)
D. Total Cost (A+B+C)		**90399**
Assistance		**54239**
Assistance rounded		**54000**
Bank Loan		**22500**
Own Contribution		**13899**

3.2 Construction of Community Fish Ponds

Harvesting from community pond at Khulia Village (Ri-Bhoi District)

The people of the State exhibit strong community bonds and culture of community management of village resources. This is evident from the earlier experience of the Department of Fisheries. The Department has created some community ponds in the past and their maintenance is rated as good even now. Mawpdang Community Pond, Jaud Community Pond, Lyniong Community, Khulia Community pond, Bonbudai Community Pond, Mawtneng Community Pond are examples of such successful ponds. For instance, the Mawtneng Community Pond in Ri-Bhoi District is so efficiently managed that the revenue earned from the sale of fish is used for community needs like salary of teachers in the village school. The total target for the community ponds is 500 hectares. Fishery Co-operative Societies and Multi Purpose Co-operative Societies will also be considered for engagement in the construction of community ponds. As shown in Chapter IV, an extent of 27.5 hectares will be allocated to FCS and MPCS. The same norms as prescribed for the community ponds will also be applied for the co-operative sector also.

1. Yearly Targets

The Mini-Mission intends to develop 500 hectares of water area under community ponds at the rate of 100 hectares each year. The size of a pond for support is fixed at 0.5 hectare subject to a maximum of 2.00 hectares each. Out of the 500 hectares targeted for the construction of community ponds, 143 hectares will be allocated to the FCS and MPCS allocating it to different years. The cost of this item which comes under Mini Mission I is shown in Mini Mission II as all the components allocated to the Co-operatives are shown there.

2. Cost of Construction

Based on the Government of India norm, the cost of community pond is taken as ₹ 2.50 lakhs for 0.5 ha of which ₹ 2.00 lakhs is for construction of the pond and the balance ₹ 0.50 lakh is for inputs. This is less than the cost allowed for individual ponds. The difference between the two categories of ponds arises only in the case of capital cost for which the Government of India norm of ₹ 4.00 lakhs per hectare is adopted. The community is expected to contribute in the construction of the pond. Hence, the actual cost is not considered in the calculation of capital cost.

The lower cost allowance for the community pond as compared to the individual pond is justified on the principle that community is expected to provide labour for digging the pond which is the main item of expenditure in the capital cost. This is not possible for an individual farmer because a family will have limited number of workers and they cannot complete a significant portion of the work within a given period. Hence, capital cost estimates are prepared on the basis of actual requirement of labour for individual ponds and at the Government of India norm for community ponds. However, provision for inflation will be made even for the community ponds from second year onwards. There will be adjustment for escalation in capital cost due to increase in MGNREGS wage rate. No such adjustment will be made for changes in input prices.

The same input norms are used in estimating the recurring costs for both individual and community ponds. However, there is a difference between individual ponds and community ponds in respect of duration of support for feed. Individual ponds will be provided with the feed for three years whereas community ponds will be provided only for one year. Community is expected to manage all the inputs from the second year onwards. The capital cost of construction of a community pond of 0.5 hectare is ₹ 2.50 lakhs of which 60 percent or ₹ 1.50 lakhs will be given as assistance. The balance ₹ 1.00 lakh will have to be contributed by the community in the form of labour for the construction of the pond. Input costs are estimated following the norm of 0.5 hectare. The details are shown in Table 3.4.

Table 3.4: Capital and Recurring Costs of Community Pond (0.5 hectare)

S. No.	Item	Specification	Value (₹)
	Capital Cost		
	Area of the Pond	5000 sq.m.	----
	Depth of the Pond	1.5 m.	----
	Volume of the Pond	7500 m^3	----
	A.C pipes	2 Nos.	----
A	**Total capital expenditure (Govt. of India norm)**		**2,00,000**

S. No.	Item	Specification	Value (₹)
	Recurring Annual Expenditure		
	Lime 500 kg @ ₹ 12/- per kg	500 x 12	6,000
	Raw cow dung 5000 kg @ ₹ 1/- per kg	5000 x 1	5,000
	Ammonium Super phosphate 100 kg @ ₹ 8/- per kg	100 x 8	800
	Urea 100 kg @ ₹ 8/- per kg	100 x 8	800
	IMC and Exotic Carp fingerlings @ ₹ 2/- each	5000 nos.	10,000
	Rice bran 250 kg @ ₹ 5/- per kg	250 x 15	3,750
	Oil cake 250 kg @ ₹ 20/- per kg	250 x 20	5,000
	Prophylactic measures against diseases	L/S	4,000
	Fishing equipment	L/S	10,330
	Labour 36 man days @ ₹ 120/- per day	36 x 120	4,320
B	**Total recurring expenditure per annum**		**50,000**
C	**Total capital and recurring expenditure (A+B)**		**2,50, 000**
	Financing the Scheme		
D	**Government Assistance @ 60 %**	**2,50,000 x 0.6**	**1,50,000**
E	**Community Contribution @ 40 %**	**2,50,000 x 0.4**	**1,00,000**
	Total (D+E)		**2,50,000**

The pond size should be a minimum of 0.5 hectare below which no support will be provided for community ponds. At the same time, it is also not possible to support community ponds of more than two hectares. If the community wants to have a bigger pond, the cost for the area beyond two hectares has to be completely borne by the community. This principle will help to cover more villages in the programme following the strategy of inclusive growth as also create a certain sensitization toward the community fisheries across the state.

3.3 Reclamation of Marshy and Swampy Areas and *Bheels*

Potential Marshy/Swampy area at Damal to be developed

Marshy and swampy areas and *Bheels* are natural and permanently water logged low lying areas with overgrowth of vegetation and abundant organic matter. These water bodies can be made developed for fish production at a nominal input cost. But the capital cost will be as high as in the case of individual and community ponds. At present fish production from these bodies

is negligible. These lands, managed by the communities, village authorities, Nokmas and Sirdars, may be reclaimed and made suitable for fish production. After renovation of these water bodies, fingerlings have to be stocked. Fish will grow in these water bodies without any provision of supplementary feed as a variety of biological feeds will be available. The Mission will renovate these water bodies and stock the fingerlings if the community is willing to take up the activity of stocking the fingerlings from the second year onwards and also protect the water body from deterioration.

1. Yearly Targets

The targeted area is 500 hectares for five years and yearly targets are fixed in a graduated manner with 50 hectares in each of first and second years, 100 hectares in each of third and fourth years and 200 hectares in the fifth year. This graduated approach will help in identifying the most productive water bodies for renovation. The minimum area for a water body for renovation is two hectares and the maximum area for financial support is five hectares. This condition helps in taking up more works rather than confining to a few large water bodies. As no supplementary feed is provided and the fish will have to subsist on biological matter as well, the community will have to take responsibility for that purpose.

The capital cost of renovation is estimated at ₹ 4 lakhs per hectare as in the case of community ponds. However, the cost of inputs will be much lower in this case because only the fingerlings at @ 10000/- per hectare and equipment worth of ₹ 20,000/- will be provided. The total cost comes to ₹ 4.4 lakhs per hectare. The community will have to contribute 40 per cent (₹ 1.76 lakhs) and the remaining 60 per cent will be provided by the government in the form of assistance. The expected output is 1500 kg per hectare (Table 3.5).

Table 3.5: Year-wise Targets for Reclamation of Marshy and Swampy lands and Bheels

S. No.	Year	Area (Ha.)	Capital Cost (₹ Lakhs)	Recurring Expenditure (₹ Lakhs)	Total Expenditure (₹ Lakhs)	Production (MT) (@ 1.5 MT/Ha.)	Value of Output (₹ Lakhs)
1.	2012-13	50	200	20	220	75.00	90.00
2.	2013-14	50	200	20	220	75.00	90.00
3.	2014-15	100	400	40	440	150.00	180.00
4.	2015-16	100	400	40	440	150.00	180.00
5.	2016-17	200	800	80	880	300.00	360.00
Total		**500**	**2000**	**200**	**2200**	**750.00**	**900.00**

3.4 Stocking of Fingerlings in Reservoirs, Lakes and other smaller Water Bodies

The State has three important reservoirs namely Umiam, Kyrdemkulai and Nongmahir. The Umiam reservoir is the largest of the three with an area of 500 hectares. The remaining two reservoirs together have an area of 160 hectares. The area under reservoirs comes to 650

hectares. Besides these three reservoirs, there are several lakes. The Department of Fisheries has identified 24 such lakes so far with a total area of 50 hectares spread over six districts. The total area under reservoirs and identified lakes comes to 700 hectares.

A view of Umïam Lake, Meghalaya

Fish production in the State can be enhanced merely by stocking fingerlings in these water bodies. It would be feasible to stock 2000 fingerlings per hectare as these water bodies are mainly meant for irrigation and fingerlings stocked in these water bodies have to subsist on natural feeds. As this is the activity of the department and there is not much role for the community, this stocking will be continued in all the five years of the Mission. Assuming 40 percent mortality and average weight of 0.15 kg per fish, output per hectare will be 180 kg (0.6 x 0.15 x 2000). The total output comes to 126.00 MT per year and 630 MT for five years (Table 3.6).

Table 3.6: Cost and Returns form Fish Development in Reservoirs and Lakes

Name of the Reservoir	Water Area (Ha)	Fingerlings to be Stocked (@2000/ha.)	Cost of fingerlings @ ₹ 2 (₹ Lakhs)	Output per Year (MT)	Total Output for Five Years
Umiam	500	10.0	20.0	90.0	450.0
Kyrdemkulai	80	1.6	3.2	14.4	72.0
Nongmahir	70	1.4	2.8	12.6	63.0
Total Reservoirs	**650**	**13.0**	**26.0**	**117.0**	**585.0**
Total Lakes	**50**	**1.0**	**2.0**	**9.0**	**45.0**
Reservoirs & Lakes	**700**	**14.0**	**28.0**	**126.0**	**630.0**

3.5 Loan and Assistance for Production Expansion Programme

The cost of the programme by component is shown in Table 3.7. The total cost of the programme is ₹ 933.74 crores. Area expansion through individual ponds is the main component in the Mini-Mission-1 with an expenditure of ₹ 904.00 crores. It accounts for 96.81 per cent of the total cost. Next in importance is the reclamation of swampy lands, marshy lands and bheels. The total cost of this component is ₹ 22.00 crores. The other two components are very small in terms of cost. Construction of community ponds costs only ₹ 5.00 crores and fish production in reservoirs costs only ₹ 2.74 crores.

The cost to the government for the programme is ₹ 561.34 crores. This amount has to be paid as assistance. The balance of ₹ 372.40 crores will be the cost to the society. A part of this cost (60.7 per cent or ₹ 226.00 crores) will come to them as bank loan and the balance will have to be paid by the community in the form of labour. The cost of assistance is ₹ 83.82 crores in the first year and it goes up to ₹ 136.60 crores in the last year. There will be increase in the cost if the MGNREGS wage rate is revised. As there is not much expenditure on other capital items, the cost of construction of ponds will not increase much.

Table 3.7: Year-wise Assistance, Loan and Farmer's Contribution (₹ Lakhs)

Year	Item	Individual Ponds	Community Ponds	Reclamation of Bheels etc.	Reservoirs and Lakes	Total of All Activities
2012-13	Assistance	8136.00	60.00	132.00	54.80	8382.80
	Loan	3390.00	-	-	-	3390.00
	Own Fund	2034.00	40.00	88.00	-	2162.00
	Total Cost	**13560.00**	**100.00**	**220.00**	**54.80**	**13934.80**
2013-14	Assistance	9763.20	60.00	132.00	54.80	10010.00
	Loan	4068.00	-	-	-	4068.00
	Own Fund	2440.80	40.00	88.00	-	2568.80
	Total Cost	**16272.00**	**100.00**	**220.00**	**54.80**	**16646.80**
2014-15	Assistance	10848.00	60.00	264.00	54.80	11226.80
	Loan	4520.00	-	-	-	4520.00
	Own Fund	2712.00	40.00	176.00	-	2928.00
	Total Cost	**18080.00**	**100.00**	**440.00**	**54.80**	**18674.80**
2015-16	Assistance	12475.20	60.00	264.00	54.80	12854.00
	Loan	5198.00	-	-	-	5198.00
	Own Fund	3118.80	40.00	176.00	-	3334.80
	Total Cost	**20792.00**	**100.00**	**440.00**	**54.80**	**21386.80**
2016-17	Assistance	13017.60	60.00	528.00	54.80	13660.40
	Loan	5424.00	-	-	-	5424.00
	Own Fund	3254.40	40.00	352.00	-	3646.40
	Total Cost	**21696.00**	**100.00**	**880.00**	**54.80**	**22730.80**
Total	Assistance	54240.00	300.00	1320.00	274.00	56134.00
	Loan	22600.00	-	-	-	22600.00
	Own Fund	13560.00	200.00	**880.00**	-	14640.00
	Total Cost	**90400.00**	**500.00**	**2200.00**	**274.00**	**93374.00**
	Percentage	**96.81**	**0.54**	**2.36**	**0.29**	**100.00**

3.6 Impact of Mini-Mission I

The returns from the production expansion schemes are shown in Table 3.8. The total area that will be expanded in five years will be 11000 hectares. In addition to this, fingerlings will be stocked in another 700 hectares every year. The total area in which fingerlings stocked under the programme comes to 14500 hectares. There will be increase in production by 26580 MT. Most of the increase in production (90.3 per cent) is due to construction of individual ponds. The value of production comes to ₹ 318.96 crores.

The capital output ratio for the project comes to 2.93, which is very low by all standards. Further, the capital cost almost completely goes as wages. The programme is highly significant for poverty alleviation. The capital output ratio will rise slightly when capacity building is added. Even after that, the project is very efficient as it addresses the problem of poverty by providing adequate subsidiary income to cross the poverty line.

Though the Mission keeps growth as the primary concern, it has followed pro-poor strategy. By keeping the area for support at 0.1 hectare, it is able to cover one lakh farmers. Most of the beneficiaries are expected to be poor. Thus, the programme is inherently self-targeting in nature. The major emphasis of the programme is on inclusive growth. At the same time, there is a need to be cautious in implementation as it is mostly concerned with the poor. Because of this, the Mission is adopting a holistic approach and is intervening in input supply and output marketing.

The implementation starts with a small area in the first year and increases progressively from the second year onwards. It gives a great scope for mid-term corrections. Close monitoring and concurrent evaluation will help in increasing the efficiency of implementation.

Table 3.8: Years-wise Area, Productivity and Production of Fish from Different Schemes

Year	Item	Individual Ponds	Community Ponds	Reclamation of Bheels etc.	Reservoirs and Lakes	All Schemes
2012-13	Area (Ha.)	1500	100	50	700	2350
	Yield (Kg/Ha.)	2400	2400	1500	180	1.720
	Production (MT)	3600	240	75	126	4041
	Value (₹ Lakhs)	4320	288	90	151.2	4849.2
2013-14	Area (Ha.)	1800	100	50	700	2650
	Yield (Kg /Ha.)	2400	2400	1500	180	1.797
	Production (MT)	4320	240	75	126	4761
	Value (₹ Lakhs)	5184	288	90	151.2	5713.2

Year	Item	Individual Ponds	Community Ponds	Reclamation of Bheels etc.	Reservoirs and Lakes	All Schemes
2014-15	Area (Ha.)	2000	100	100	700	2900
	Yield (Kg /Ha.)	2400	2400	1500	180	1.833
	Production (MT)	4800	240	150	126	5316
	Value (₹ Lakhs)	5760	288	180	151.2	6379.2
2015-16	Area (Ha.)	2300	100	100	700	3200
	Yield (Kg /Ha.)	2400	2400	1500	180	1.886
	Production (MT)	5520	240	150	126	6036
	Value (₹ Lakhs)	6624	288	180	151.2	7243.2
2016-17	Area (Ha.)	2400	100	200	700	3400
	Yield (Kg /Ha.)	2400	2400	1500	180	1.890
	Production (MT)	5760	240	300	126	6426
	Value (₹ Lakhs)	6912	288	360	151.2	7711.2
All Years	**Area (Ha.)**	**10000**	**500**	**500**	**3500**	**14500**
	Yield (Kg /Ha.)	**2400**	**2400**	**1500**	**180**	**1.833**
	Production (MT)	**24000**	**1200**	**750**	**630**	**26580**
	Value (₹ Lakhs)	**28800**	**1440**	**900**	**756**	**31896**

3.7 Summary and Conclusions

The Mini-Mission I, with a focus on production expansion, adopts a two-fold strategy of expanding the area under fish ponds and utilizing the already existing water bodies for fish production. The area expansion component is mainly intended to benefit the poor by providing financial support in the form of assistance and loan. The programme will cover one lakh poor farmers. They are assisted in the construction of the pond and recurring expenditure for one year. In addition, as feed support will be provided for three years they will not face any problem in maintaining the pond even after the repayment commences.

The cost of construction and inputs for one year with feed for three years comes to ₹ 90400/-. Community ponds are restricted to two hectares so that the scheme can cover a large number of villages. The scheme provides an assistance of ₹ 6 lakhs and the community has to contribute ₹ 4 lakhs in the form of labour for the construction of the pond. The condition that 40 per cent of the investment must come from the village will protect it from the misuse of the scheme. The total extent of land to be developed for community ponds is 500 hectares.

Development of marshy and swampy lands and Bheels is intended for production intensification on the existing water bodies. Only capital expenditure will be incurred and use

of inputs will be restricted to stocking of fingerlings. This is more an experiment than large scale expansion of area under it. If the experiment is successful, it can be up scaled later. This requires community participation and management. Only 500 hectares will be covered under the programme.

A very important component from the point of maximising the productivity of water is development of fisheries on reservoirs and lakes. This component is based on inter-departmental convergence. If it succeeds, it will pave the way for integrated approach in development.

The total increase in production due to the Mission is 26580 MT, which is five times the existing production. The value of annual production at the end of the project comes to ₹ 318.96 crores per annum. The state will become self-sufficient in fish by the end of the Mission. The total cost of the Mini-Mission-I is ₹ 933.74 crores and assistance is ₹ 561.34 crores. Assistance is the major component with a share of 60.1 per cent in the production expansion scheme. When other components are included, the share of government increases further.

The programme is based on the principle of inclusive growth as only small entrepreneurs are covered and the assistance is biased towards the poor. It has the nature of self-targeting.

Table 3.9: Year-wise Physical Target in Hectares for Individual Ponds

S. No.	Block/District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
1.	Amlarem	52	63	70	81	84	350
2.	Khliehriat	33	40	44	50	53	220
3.	Laskein	20	23	26	30	31	130
4.	Thadlaskein	20	23	26	30	31	130
5.	Saipung	8	9	10	11	12	50
	Jaintia Hills	**133**	**158**	**176**	**202**	**211**	**880**
1.	Pynursula	62	74	82	94	98	410
2.	Shella Bholagang	45	54	60	69	72	300
3.	Mawsynram	18	22	24	28	28	120
4.	Mawphlang	18	22	24	28	28	120
5.	Mylliem	12	14	16	18	20	80
6.	Mawryngknang	8	9	10	11	12	50
7.	Mawkynrew	8	9	10	11	12	50
8.	Laitkroh	8	9	10	11	12	50
	East Khasi Hills	**179**	**213**	**236**	**270**	**282**	**1180**

S. No.	Block/District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
1.	Mawshynrut	52	64	72	83	87	360
2.	Nongstoin	32	38	45	52	54	219
3.	Mawkyrwat	19	23	26	30	32	130
4.	Mawthadraishan	16	20	20	25	26	107
5.	Ranikor	16	20	20	25	26	107
6.	Mairang	16	20	20	25	26	107
	West Khasi Hills	**151**	**185**	**203**	**240**	**251**	**1030**
1.	Umling	78	92	102	116	122	510
2.	Umsning	52	62	67	78	81	340
3.	Jirang	39	45	50	57	59	250
	Ri-Bhoi	**169**	**199**	**219**	**251**	**262**	**1100**
1.	Selsella	115	145	164	186	190	800
2.	Trikrikilla	87	104	116	133	140	580
3.	Betasing	87	104	116	133	140	580
4.	Zikzak	56	67	74	85	88	370
5.	Dalu Gambeggre	35	41	46	53	55	230
6.	Dadenggiri	35	41	46	53	55	230
7.	Gambeggre	35	41	46	53	55	230
8.	Rongram	21	25	28	32	34	140
	West Garo Hills	**471**	**568**	**636**	**728**	**757**	**3160**
1.	Resubelpara	70	87	97	110	116	480
2.	Dombo Rongjung	48	58	64	74	76	320
3.	Kharkutta	35	41	46	53	55	230
4.	Songsak	27	32	36	41	44	180
5.	Samanda	27	32	36	41	44	180
	East Garo Hills	**207**	**250**	**279**	**319**	**335**	**1390**
1.	Gasupara	72	87	96	110	115	480
2.	Chokpot	48	58	63	74	77	320
3.	Rongara	35	41	46	53	55	230
4.	Bhagmara	35	41	46	53	55	230
	South Garo Hills	**190**	**227**	**251**	**290**	**302**	**1260**
	State Total	**1500**	**1800**	**2000**	**2300**	**2400**	**10000**

Chapter IV

Mini Mission - II

Critical Infrastructure Development

Introduction

Digrichiring Fish Seed Farm, West Garo Hills District

The Meghalaya State Aquaculture Mission aims at a large expansion of area under fish ponds besides developing fish production on the existing water bodies. The total area planned for expansion of individual ponds is 10000 hectares. Besides this, the Mission aims at utilising all the marshy and swampy lands and bheels for the development of fisheries. In these water bodies, the available natural grasses are sufficient and there is no need to give supplementary feed. Similarly, fish can also be grown in other water bodies like reservoirs and lakes without any other investment except stocking fingerlings.

Productivity per hectare of water area depends mainly on seed, feed and health care. The Mini-Mission II focuses on the provision of infrastructure needed for the development of new water area, besides bridging the existing gap. The infrastructure required can be classified into pre and post-harvest infrastructure. Seed, feed and health care are the items in pre-harvest infrastructure, and storage, transport and marketing are considered as post-harvest infrastructure. However, at the present stage of development, there is a need to create only some of the items of post-harvest infrastructure. This chapter focuses on the creation of critical infrastructure.

The chapter is organised in six sections. Section II provides the plan for fish seed production and distribution in the State. Expansion of Seed production can be achieved in three ways viz., by up-grading the existing departmental hatcheries and establishment of private hatcheries with the support of the government. In recent times, portable hatcheries have been developed at CIFA, Bhubaneswar. These hatcheries will also be introduced in the State to encourage decentralized production of fingerlings.

Section III deals with feed production. At present, farmers are feeding rice bran and oil cake at low quantities. Other nutrients required for the fast growth of fish are missing in the feed. In order

to cultivate the habit of feeding concentrates, a few small scale feed mills will be established in the private sector with the financial support of the government.

Lack of health care facilities is another constraint in improving the productivity in the fisheries sector. Section IV deals with the issue of providing health care for which two laboratories will be established in the State. Section V focuses on the important post-harvest infrastructure. At present, there is an urgent need only for equipment (tools, kits, nets and boats) and markets. There are about 50 fishermen cooperatives in the State and most of them are in a dormant state. The Mission will strengthen and make them active. Besides this, the Mission also attempts to strengthen the Fish Farmers' Development Agency, the implementing agency of the activities of the Mission. Section VI provides a brief summary and findings of the chapter.

4.1 Fish Seed Production

The expansion of area under 'The Thousand Pond Scheme' has increased the demand for fish seed in the state. Seed production was not taken up under the Scheme and most of the departmental hatcheries are not in a good condition for want of repairs. Farmers are compelled to get fingerlings from far off places and face the adverse consequences of high mortality. The State Aquaculture Mission has a programme of expanding the area under fish ponds by 10,000 hectares. Community lands of another 500 hectares will also be developed for fisheries. In addition to this, an extent of 500 hectares under swampy and marshy areas and *bheels* will be reclaimed for fish production. Thus, the area expansion scheme has a target of 11,000 hectares. This component of the scheme requires 1,100 lakh fingerlings. Besides this, fish production will also be taken up in the existing lakes and reservoirs to an extent of 700 hectares. The targeted area under this category is 700 hectares. Since no supplementary feed will be provided, fingerlings will be released only at a lower rate of 2,000 per hectare. But the release will be taken up every year and hence the total requirement comes to 10,000 per hectare. The total requirement of fingerlings for this component will be 70.00 lakh. Thus the total demand for fingerlings comes to 1,170 lakh.

The year-wise break-up of the additional demand for fingerlings is shown in Table 4.1. The demand increases from 179.00 lakh in 2012-13 to 264.00 lakh in 2016-17. The total demand in each year has to be worked out by cumulating the additional demand and also adding the initial gap.

Table 4.1: Year-wise Additional Demand for Fingerlings (Lakhs)

Year	Ponds and Reclamation of Swampy Areas		Reservoirs and Lakes*		Total	
	Area (ha.)	Fingerlings @ 10,000/ha.	Area (ha.)	Fingerlings @ 2000/ha.	Area (ha.)	Fingerlings (lakhs)
2012-13	1650	165	700	14.00	2350	179.00
2013-14	1950	195	700	14.00	2650	209.00

Year	Ponds and Reclamation of Swampy Areas		Reservoirs and Lakes*		Total	
	Area (ha.)	Fingerlings @ 10,000/ha.	Area (ha.)	Fingerlings @ 2000/ha.	Area (ha.)	Fingerlings (lakhs)
2014-15	2200	220	700	14.00	2900	234.00
2015-16	2400	240	700	14.00	3100	254.00
2016-17	2500	250	700	14.00	3200	264.00
Total	**10700**	**1070**	**700**	**70.00**	**14200**	**1140.00**

* The same area of 700 hectares under reservoirs & lakes will be treated for five years.

Estimation of initial gap is fraught with problems because data on area under fish ponds and production of fish are highly under-stated. As the initial gap is estimated on the basis of the published data on production, the estimate will be on a lower side. During 2010-11, fish production in the State was 4,533 MT. For this production, 190.35 lakh fingerlings must have been used. But the supply from the departmental hatcheries was only 29.63 lakh. As there was no production of fingerlings in the private sector, the initial gap is estimated at 160.72 lakh (Table 4.2).

Table 4.2: Demand for and Supply of Fingerlings in the Year 2010-11

Item	Value
Fish production (MT)	45.33
Fingerlings needed per kg fish (No.)	4.2
Total fingerlings needed (lakh)	190.35
Fingerlings supplied (lakh)	29.63
Shortage of fingerlings (lakh)	160.72

The demand for the first year of the Mission (2012-13) is 382.75 lakh which consists of the initial gap of 190.35 lakh and additional demand of 192.4 lakh during the year. It will reach 1,397.35 by the end of the Mission in a progressive manner (Table 4.3). The major part of the demand (80 percent) comes from individual ponds, which are owned by the poor. There is a need to arrange the timely supply of seed, in the absence of which farmers may leave the activity.

The supply of fingerlings has to be managed as per the demand and the total supply should increase to 1,397.37 lakh by the end of the Mission. To achieve this, the existing supply channels have to be made active and new channels have to be created.

Table 4.3: Year-wise Total Demand for Fingerlings (Lakhs)

Year	Additional Demand	Total Demand
Base Year	-	190.35
2012-13	192.4	382.75
2013-14	222.4	605.15
2014-15	247.4	852.55
2015-16	267.4	1119.95
2016-17	277.4	1397.35

The most important source of fingerlings is the departmental hatcheries. At present, there are 17 departmental farms/hatcheries, besides one Trout Farm. But, most of them are in dilapidated condition needing immediate repairs. Some of them are in the process of up-gradation under the financial assistance of RKVY and BRGF. The balance of renovation activities will be taken up by the Mission. The particulars of these departmental farms and their requirements are given below.

Status of Departmental Farms

There are 17 departmental farms in the State besides the Trout Farm at Shillong. Most of these farms have potential to produce fingerlings, but they are not in a very good condition due to lack of funds for repair. All these farms will be upgraded and equipped with all necessary infrastructure including hatcheries, wherever feasible.

1. **Fish Dale Farm,** located in Shillong, has a total area of 2.24 hectares. The farm produced 3.04 lakh during 2008-09. As the farm is located in a higher altitude, it is suitable for production of common carp fish seed, which is in high demand in the state. This farm will be upgraded to increase production and 1 (one) FRP will be installed.
2. **Umjar Fish Farm,** is located in Mawkynrew Development Block. It covers an area of 2.50 hectares. The Farm is in low lying area but, the supply of water is seasonal. Presently, the farm is non-functional. Breeding and culture of common carp can be taken up in this farm after its up-gradation and 1 (one) FRP will be installed.
3. **Porsohsat Fish Farm** has an area of 7.0 hectares. It is located about 5-7 kms away from Nongstoiñ. Presently, this farm is in a very bad condition with only few nurseries and stocking tanks functioning. Fish seed production is almost negligible in the farm. This farm will be up-graded and 1 (one) FRP will be installed.
4. **Laitblieh Fish Farm** has an area of 4.41 hectares. It is located at Mairang. There is no seed production from this farm for the last two years. This farm will be up-graded to revive seed production and 1 (one) FRP will be installed.

5. **Kyrdemkulai Fish Farm** has an area of 1.63 hectares. As the farm is located in a lower altitude, it is highly suitable for producing both IMC and Exotic Carp on a larger scale. This farm will be modernised and equipped with eco-circular hatcheries.
6. **Umsning Fish Farm** has an area of 3.67 hectares. The farm is upgraded with RKVY funds and it will go into production by 2012-13.
7. **Nongpoh Transit Ponds** were created to act as transit ponds. Fish seeds procured from outside the state will be stocked here before distributing to the public. Attempts were made to produce fish seeds by utilizing these ponds. This centre has the advantage of conductive temperature, sufficient water supply and central location and hence it needs up-gradation. These ponds have a total water area of 0.3 hectares and 1 (one) FRP will be installed.
8. **Mawpun** Production-cum-Research Centre has an area of 5.05 hectares. The farm is being upgraded with an expenditure of ₹ 2.00 crores under RKVY. There is also a proposal to upgrade this farm by adopting Israeli's Technology for which fishery experts from Israel have made a detailed study.
9. **Umktieh Fish Farm,** located adjacent to the ICAR Complex, has an area of 4.70 ha. The farm had 15 nursery ponds covering an area of 1514m^2. It has 4 stocking ponds. The ponds are badly damaged. As the farm posses a high potential for seed production, it requires immediate renovation with the installation of 1 (one) eco-circular hatchery.
10. **Old Thadlaskeiñ Fish Farm** has an area of 0.29 hectare. Presently production is nominal and 1 (one) FRP will be installed to boost production.
11. **New Thadlaskeiñ Fish Farm** has an area of 1.9 hectares. There is a scarcity of water. Digging of tube wells will enable the farm to produce common carp with the installation 1 (one) FRP.
12. **Gangdubi Fish Farm** has an area of 0.82 hectare. This farm has the capacity to produce substantial fish seed after up-gradation.
13. **Williamnagar Tank** has an area of 0.44 hectare. The farm does not have a regular source of water supply and tends to dry up during dry season. In view of its warm climate, the farm could be utilised seasonally from May to November to produce fish seeds of both Common carp and IMC. Water supply has to be provided to this farm.
14. **Regional Fish seed Farm, Jamge** has an area of 3.48 hectares. The farm is taken up for modernisation under RKVY with an expenditure of ₹ 1.00 crore. The existing eco-circular hatchery is also being upgraded through RKVY. The farm, after up-gradation, has a great potential for fish seed production.
15. **Digrichiring Fish Farm** has an area of 7.6 hectares. It is being modernised with BRGF funds. It has eco-hatchery and has a high potential for production of both IMC and Exotic Carp. The farm requires additional funds to make it a full-fledged fish seed production centre.

16. **Dalu Fish Farm** has an area of 0.66 hectare. Substantial investment through the Mission is required to make this farm productive as its location is highly conducive for seed production.

17. **Gasuapara Fish Farm** has an area of 1.35 hectares. This farm is taken up for modernisation under RKVY and an amount of ₹ 1.51 crores has been spent. This farm will be equipped with one eco-circular hatchery. The farm has high potential because of its climatic advantages. The cost estimates for up-gradation and the likely estimates of seed production are given in Table 4.4.

Table 4.4: Production of Fingerlings in Departmental Farms

Sl. No.	District	Name of the Farm	Area (Ha.)	Amount proposed for up-gradation (₹ Lakhs)	Present seed production	No. of Eco-Circular Hatchery to be constructed	No. of FRP to be setup	Production after up-gradation (fingerlings)
1.	EKH	Fish Dale Farm	2.24	300	3.66	-	1	15
2.		Umjar FF	2.50	250	2.00	-	1	5
3.	RB	Kyrdemkulai FF	9.50	300	0.30	1	-	30
4.		Nongpoh Transit Pond	0.30	180	0.30	-	1	5
5.		Umktieh FF*	4.75	-	-	1	-	30
6.		Umsning FF**	3.67	200	30.00	-	-	50
7.		Mawpun FF**	5.05	371		-	-	50
8.	WKH	Porsohsat FF	7.00	300	0.93	-	1	10
9.		Lait Blieh FF	4.41	250	0.10	-	1	5
10.	JH	New Thadlaskein FF	1.90	150		-	1	5
11.		Old Thadlaskein FF	0.29	50		-	1	5
12.	WGH	Digrichiring FF	7.60	230		-	-	57.35
13.		Dalu FF	0.66	60		-	1	10
14.	EGH	Gangdubi FF	1.40	120		1	-	10
15.		Williamnagar FF	1.50	50		-	1	5
16.		Jamge FF**	3.48	100		-	-	55
17.	SGH	Gasuapara FF**	1.35	100		-	-	50
	Total		**61.8**	**3461**		**3**	**9**	**397.35**

* Upgradation is being taken up under State Aquaculture Mission during 2011–12 at a cost of 235.00 lakh.

** Upgradation has been taken up under RKVY.

It is expected that the departmental hatcheries will supply a total of 397.35 lakh fingerlings during the period of the Mission. The remaining supply of 1,000 lakh fingerlings has to come from the private hatcheries.

4.2 Seed Production in Private Hatcheries

As there are no private hatcheries at present, entrepreneurship has to be developed among the local people. For this, both financial and technical support will be provided. The Mission will support private entrepreneurs to take up fish seed production by establishing modern hatcheries and FRP portable hatcheries.

The topography of the land and economic conditions of the people do not permit establishment of large hatcheries. Hence the project supports only two hectares and the entrepreneur has to bear the cost for any additional area. The project supports establishment of 15 hatcheries each with a production capacity of 1 crore spawn. Out of the one crore spawn, 40 lakh fry will remain and finally 24 lakh fingerlings will be produced. Thus, the output of fingerlings will be one-third of the spawn capacity.

1. Financial Assistance

The units will be established in a phased manner and spread in all the seven districts. Since the demand for the fingerlings will be very high in the first year, seven units (one in each district) will be established in that year. Three units will be established in each of the second and third years and the remaining two will be established in the fourth year. No unit will be established in the fifth year. Except West Garo Hills, all the other six districts will get two units each. West Garo Hills will get three units. The allocation of the units in different years is shown in Table 4.5.

The cost of each hatchery is ₹ 16 lakhs. Government will provide an assistance of 60 percent of the total cost and also arrange 25 percent as bank loan. The balance 15 per cent will have to be invested by the entrepreneur as margin money. The amount of assistance comes to ₹ 9.60 lakh and loan ₹ 4.0 lakh. The balance of ₹ 2.4 lakhs will be the margin money.

Table 4.5: District-wise Allocation and Cost of Private Hatcheries

District	Item	2012-13	2013-14	2014-15	2015-16	Total
EKH	Number	1	1			2
	Assistance	9.6	9.6			19.2
	Loan	4.0	4.0			8.0
	Own	2.4	2.4			4.8
	Total	**16.0**	**16.0**			**32.0**
WKH	Number	1		1		2
	Assistance	9.6		9.6		19.2
	Loan	8.0		8.0		8.0
	Own	2.4		2.4		4.8
	Total	**16.0**		**16.0**		**32.0**

District	Item	2012-13	2013-14	2014-15	2015-16	Total
RB	Number	1	1			2
	Assistance	9.6	9.6			19.2
	Loan	4.0	4.0			8.0
	Own	2.4	2.4			4.8
	Total	**16.0**	**16.0**			**32.0**
JH	Number	1			1	2
	Assistance	9.6			9.6	19.2
	Loan	4.0			4.0	8.0
	Own	2.4			2.4	4.8
	Total	**16.0**			**16.0**	**32.0**
WGH	Number	1	1	1		3
	Assistance	9.6	9.6	9.6		28.8
	Loan	4.0	4.0	4.0		12.0
	Own	2.4	2.4	2.4		7.2
	Total	**16.0**	**16.0**	**16.0**		**48.0**
EGH	Number	1			1	2
	Assistance	9.6			9.6	19.2
	Loan	4.0			4.0	8.0
	Own	2.4			2.4	4.8
	Total	**16.0**			**16.0**	**32.0**
SGH	Number	1		1		2
	Assistance	9.6		9.6		19.2
	Loan	4.0		4.0		8.0
	Own	2.4		2.4		4.8
	Total	**16.0**		**16.0**		**32.0**
State	**Number**	**7**	**3**	**3**	**2**	**15**
	Assistance	**67.2**	**28.8**	**28.8**	**19.2**	**144.0**
	Loan	**28.0**	**12.0**	**12.0**	**8.0**	**60.0**
	Own	**16.8**	**7.2**	**7.2**	**4.8**	**36.0**
	Total	**112.0**	**48.0**	**48.0**	**32.0**	**240.0**

4.3 Establishment of Portable FRP Hatcheries in the Private Sector

The CIFA of Bhubaneswar developed Fabricated Reinforcement Plastic (FRP) technology for Carp seed production in 2004 and supplied 126 hatcheries to different states so far. Being smaller in size, it can be easily transported. This technology would be introduced in Meghalaya through the Aquaculture Mission. Progressive fish farmers having a minimum water area of one hectare or SHGs or Fishery Cooperative Societies will be sanctioned the scheme which carries assistance and bank loan.

Each hatchery has a production capacity of 30 lakh spawn, which gives 12 lakh fry and finally 10 lakh fingerlings. The scheme will cover 77 beneficiaries. The cost of the unit is ₹ 2.34 lakhs. The scheme will provide 60 per cent assistance amounting to ₹ 1,40,400/- and 25 per cent bank loan amounting to ₹ 58,500/-. The balance of 15 percent amounting to ₹ 35,100/- has to be provided by the beneficiary as own contribution (Table 4.6).

Table 4.6: District-wise Allocation and Cost of FRP Portable Hatcheries

District	Item	2012-13	2013-14	2014-15	2015-16	2016-17	Total
EKH	Number	3	3	2	2	1	11
	Assistance	4.212	4.212	2.808	2.808	1.404	15.444
	Loan	1.755	1.755	1.17	1.17	0.585	6.435
	Own	1.053	1.053	0.702	0.702	0.351	3.861
	Total	**7.02**	**7.02**	**4.68**	**4.68**	**2.34**	**25.74**
WKH	Number	2	3	2	2	1	10
	Assistance	2.808	4.212	2.808	2.808	1.404	14.040
	Loan	1.17	1.755	1.17	1.17	0.585	5.85
	Own	0.702	1.053	0.702	0.702	0.351	3.51
	Total	**4.68**	**7.02**	**4.68**	**4.68**	**2.34**	**23.4**
RB	Number	3	3	2	3	1	12
	Assistance	4.212	4.212	2.808	4.212	1.404	16.848
	Loan	1.755	1.755	1.17	1.755	0.585	7.02
	Own	1.053	1.053	0.702	1.053	0.351	4.212
	Total	**7.02**	**7.02**	**4.68**	**7.02**	**2.34**	**28.08**
JH	Number	3	2	2	2	1	10
	Assistance	4.212	2.808	2.808	2.808	1.404	14.040
	Loan	1.755	1.17	1.17	1.17	0.585	5.85
	Own	1.053	0.702	0.702	0.702	0.351	3.51
	Total	**7.02**	**4.68**	**4.68**	**4.68**	**2.34**	**23.4**

District	Item	2012-13	2013-14	2014-15	2015-16	2016-17	Total
WGH	Number	3	3	3	2	1	12
	Assistance	4.212	4.212	4.212	2.808	1.404	16.848
	Loan	1.755	1.755	1.755	1.17	0.585	7.02
	Own	1.053	1.053	1.053	0.702	0.351	4.212
	Total	**7.02**	**7.02**	**7.02**	**4.68**	**2.34**	**28.08**
EGH	Number	3	3	2	2	1	11
	Assistance	4.212	4.212	2.808	2.808	1.404	15.444
	Loan	1.755	1.755	1.17	1.17	0.585	6.435
	Own	1.053	1.053	0.702	0.702	0.351	3.861
	Total	**7.02**	**7.02**	**4.68**	**4.68**	**2.34**	**25.74**
SGH	Number	3	3	2	2	1	11
	Assistance	4.212	4.212	2.808	2.808	1.404	15.444
	Loan	1.755	1.755	1.17	1.17	0.585	6.435
	Own	1.053	1.053	0.702	0.702	0.351	3.861
	Total	**7.02**	**7.02**	**4.68**	**4.68**	**2.34**	**25.74**
State	**Number**	**20**	**20**	**15**	**15**	**7**	**77**
	Assistance	**28.08**	**28.08**	**21.06**	**21.06**	**9.828**	**108.108**
	Loan	**11.7**	**11.7**	**8.775**	**8.775**	**4.095**	**45.045**
	Own	**7.02**	**7.02**	**5.265**	**5.265**	**2.457**	**27.027**
	Total	**46.8**	**46.8**	**35.1**	**35.1**	**16.38**	**180.180**

The total supply of fingerlings from departmental farms, and private hatcheries is shown in Table 4.7. The departmental farms will increase the supply from 50 lakh fingerlings in 2012-13 to 150 lakh fingerlings in 2016-17. The supply from the private hatcheries will increase every year as the hatcheries are established in a phased manner. The total supply of fingerlings will increase from 350 lakhs during 2012-13 to 1420 lakhs during 2016-17. Supply is slightly more than the demand and it is necessary to manage the supply shocks.

Table 4.7: Total Supply of Fingerlings in Public and Private Sectors (lakhs)

Year	Departmental Farms	Private Hatcheries	FRP Hatcheries	Total Supply	Total Demand
2012-13	50	100	200	350	353.1
2013-14	80	200	400	680	575.5
2014-15	100	333	550	983	822.9
2015-16	120	500	700	1320	1100.3
2016-17	150	500	770	1420	1387.7

4.4 Fish seed production through Israeli Technology

Israeli technology is ideal for large scale, low cost production of premium quality fresh fish. The technology offers a Total project Approach from the design, construction and operation of scientific fish farming. The technology operates according to the highest international standards, environmental, health and quality standards.

Israeli technology will be tried in two farms, viz. Digrichiring fish farm in Tura and Mawpun fish farm in Ri-Bhoi District. Infrastructure, growing methods, reproduction facility, management protocol, etc. will be developed in these two farms.

An amount of ₹ 5.00 crores is earmarked for inducting Israeli Technology for fish seed production in the state.

4.5 Fish Feed Production

The mission intends to expand the area under fish ponds by 10,500 hectares in five years. In the first year of the Mission, 1600 hectares of water area will be expanded. The feed requirement for this area comes to 2400 MT per year at the rate of 1.5 MT per hectare. The requirement per day comes to 8 MT on the assumption that feed is required for 300 days in a year. The feed requirement by the end of the fifth year comes to about 15000 MT or 50 MT per day.

The quick survey of tanks in Ri-Bhoi revealed that they feed rice bran and oil cake directly in the ratio of 1:1 and concentrate feed is not used. Some of the farmers are aware of the importance of concentrated feed, but they are not ready to switch in a big way. Presently, feed is managed with the locally available rice bran and oil cake coming from Assam. When the Mission is expanding the area four times the present area, there will certainly be pressure on feed supply. The Mission will continuously monitor the feed situation in the State and make necessary interventions.

The Mission seeks to introduce concentrate feed in the State. With this objective in mind, a quick study of feed mills is carried out by the department in Andhra Pradesh and Kerala, the two States where aquaculture is in a highly advanced stage. The survey of farmers producing fish in fresh water in Andhra Pradesh revealed that many farmers are still feeding de-oiled rice bran (DORB) directly without giving any concentrate feed. Some of them are giving feed supplement which is mixed with traditional feed in the ratio of 4:1. However, they are now switching to concentrate feed.

A study of feed mills in Andhra Pradesh answered the following questions. The first question is whether it would be advantageous to go for large scale production rather than small scale production. In other words, are there economies of scale in feed production? It is found that there are no economies of scale. But, a large scale unit has the advantage of having independent marketing network and can cater even to the export market. Differences in the

cost of production arise only due to the nutritional standards followed in the preparation of feed.

The second question is whether it is advantageous to have a mill which can produce different livestock feeds. In other words, are there economies of scope in feed manufacturing? It is found that there are no advantages in producing livestock and fish feed in the same factory. Though the capital cost can be reduced to some extent, there are operational difficulties. The machinery has to be cleaned every time when there is a change from one feed to another.

The third question is about the cost of production. The sale price of feed is about ₹ 18/- in all the mills. Availability of inputs at a low price is responsible for low output price. Rice bran (DORB), oil cake and fish meal are available at a low price. This is responsible for low price of the feed.

The last issue is about the differences in the sizes of the plant. Most of the feed mills have a large capacity of 250 to 300 MT per day. The smallest unit visited has a capacity of 10 MT per shift. Investment needed for its establishment comes to ₹ 1.75 crores for machinery and equipment and another ₹ 0.25 crore for working capital.

It is felt that even this capacity is not required at this juncture and a unit with a capacity of about one MT will be ideal to start with. Such unit was found in Kerala. It is maintained by a SHG of eight members. The installed capacity is 300 to 500 kg per day. The unit was established in 2010 at a cost of ₹ 9.7 lakhs including installation charges. If adjustment is made for inflation, the cost will come to ₹ 12 lakhs. The aspect of transportation from Tamil Nadu (Coimbatore) to Meghalaya has also to be considered. The capital cost and running expenses for a short period may be taken as ₹ 18 lakhs. The unit will generate employment for eight persons and women can manage the unit. The feed contains 25 percent protein and the cost of production is ₹ 45 per kg. The input cost is ₹ 30 and labour cost ₹ 15.

Since the capacity of each feed mill is only 0.3 MT, there is a need to support at least five mills in each district. One mill will be supported in each district in the first year. As it starts production, one more mill will be added each year in each district. Thus, two units will be established in each of the seven districts. The monitoring report will provide assessment of the functioning of the unit so that problems can be sorted out and decisions can be taken about the establishment of additional units.

The second aspect is the selection of beneficiary. Since it is a small unit that can be managed by women, it will be given to SHGs or Fishery co-operatives as well as enterprising progressive farmers and individuals. The latter has the advantage of creating demand internally. The labour cost need not be considered and the cost of production will be low. The

selection will be based on two criteria: The unit will be established in a village where the fishing activity is high and it will be given to an active agency.

Wide publicity will be given about the support and applications will be called for. The received applications will be evaluated on the basis of the above two criteria. The other procedures will be the same as in the case of community ponds. The cost estimates for feed mills to be established are shown in Table 4.8. The cost for other years will have to be revised by about ₹ 1 lakh per year to cover the price rise. Anyway, the actual prices have to be obtained and purchases have to be made on the basis of these prices.

Table 4.8: District-wise Allocation and Cost of Fish Feed Mills

District	Item	2012-13	2013-14	Total
EKH	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**
WKH	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**
RB	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**
JH	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**
WGH	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**

District	Item	2012-13	2013-14	Total
EGH	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**
SGH	Number	1	1	2
	Assistance	10.80	10.80	21.60
	Loan	4.50	4.50	9.00
	Own	2.70	2.70	5.40
	Total	**18.00**	**18.00**	**36.00**
State	**Number**	7	7	14
	Assistance	**75.60**	**75.60**	**151.20**
	Loan	**31.50**	**31.50**	**63.00**
	Own	**18.90**	**18.90**	**37.80**
	Total	**126.00**	**126.00**	**252.00**

4.6 Fish disease management: Establishment of Laboratories

One of the major risks faced by a fish farmer is the occurrence of fish disease in ponds and tanks. Fry, fingerlings and even adult fish which get injured during transportation or even by rough handling are liable to fungal attack. With the large scale expansion of water area under the Mission it is possible that both parasitic and non-parasitic diseases will occur and the Department should be ready to deal with them. Beside common diseases, large scale mortality often occurs in rivers and streams. In the absence of testing laboratories, the actual cause of such mortality cannot be determined. Establishment of a well equipped laboratory is essential to deal with all such diseases.

The estimated cost of establishment and operational cost for one laboratory are shown in Table 4.10. Two laboratories, one in Khasi Hills and one in Garo Hills, will be established at the cost of ₹ 14 lakh. The annual operational expenditure for each laboratory is ₹ 5.6 lakhs. The operational expenditure for the two laboratories for five years will be ₹ 56 lakhs. Thus the total cost of establishing two laboratories along with operational expenditure will be ₹ 70 lakhs. The centre will provide only the diagnostic services and the cost of medicines will have to be borne by the farmers utilising the services (Table 4.9).

Table 4.9: Capital and Operational Expenditure for Fish disease Diagnostic Centres

Sl. No.	Items	Amount (₹)
Capital Expenditure		
1.	Thermo Cycler – PCR Machine	1,50,000
2.	Ultra Violet Trans illuminator	70,000
3.	Gel Electrophoresis Unit	12,000
4.	Cyclomixer – Vortex mixer	10,000
5.	Micro Centrifuge	20,000
6.	Deep Freezer	20,000
7.	Microwave Oven	15,000
8.	Laminar Flow Chamber	40,000
9.	Autoclave	6,000
10.	Microscope	30,000
11.	PH meter	15,000
12.	Micro pipettes and other glass wares	25,000
13.	Electronic Balance	30,000
14.	Water Bath	7,000
15.	Air Conditioner	30,000
16.	UPS	35,000
17.	Gas Connection and Stove	7,000
18.	Furniture	25,000
19.	Heat scaling Machine	3,500
20.	Gel Rocker	11,000
21.	Refrigerator	20,000
22.	Micro Centrifuge	20,000
23.	Equipment for Water and Soil Analysis	75,000
24.	Miscellaneous	23,500
A	**Total Capital Expenditure**	**7,00,000**
Operational Expenses		
25.	Rent of the Building (Electricity bill etc)	12,000
26	Primer for 1000 samples	3,50,000
27	Other Operating expenses	60,000
28	Salary – PCR Technician (1)	60,000
29	Lab Assistants (2)	60,000
30	Miscellaneous	18,000
B	**Total Operational Expenditure**	**5,60,000**
C	**Total Expenditure (A+B)**	**12,60,000**
D	**Capital cost for two laboratories**	**14,00,000**
E	**Operational expenses for 5 years**	**56,00,000**
F	**Total cost for five years (D+E)**	**70,00,000**

4.7 Pre and Post Harvesting Infrastructure

One of the goals of Aquaculture Mission is to increase productivity of pond culture by reducing post harvest losses. To achieve this four types of interventions are needed. The first crucial intervention is provision of proper tools and equipment. The second is development of fish markets. The third is introduction of processing technology. The fourth is introduction of technologies developed by the research institutes.

1. Tools, Kits, Nets and other Equipment

Due attention has to be given to the study of water of fish ponds as well as the study of bottom soil which plays an important role in the productivity of fish ponds. There are important physical and chemical properties of water influencing aquatic productivity such as temperature, pH, dissolved oxygen, turbidity, CO_2, dissolved nutrients like nitrogen, phosphorus, potassium, calcium, magnesium, etc which have to be considered. At present, study of water and soil of the fish ponds by the fish farmers as well as by the Department of Fisheries are not properly pursued due to lack of necessary equipments like water-soil analyser kits. The State Aquaculture Mission will address this problem by providing support for the purchase of necessary equipment and servicing of Multiple Service Providers (MSPs), who will visit the fish ponds under the Mission to test the water and soil conditions and take necessary steps for rectification.

The MSPs will also be provided with dragnets, which will be utilized for the trial netting to ensure proper growth of the fish. They are also used for bottom-raking, which not only promotes faster growth, but also prevents any building up of poisonous gases at the bottom.

For intensive fish farming and pellet feeding, there is a need for the use of pond aerators as an alternative to oxygenation of the pond. Aerators provide oxygen and also cause movement of water which allows fresh oxygen to enter and at the same time, toxic gases generated from decomposition of organic matter in the pond to escape. There are two types of aerators-fountain providing type and diffused type. As part of demonstration, both types of aerators will be procured for the progressive fish farmers as well as the departmental farms.

The Mission will also strengthen the departmental farms by providing modern equipment like water-soil analyzer kits, dragnets, happas, hand nets, aerators, etc.

2. Marketing infrastructure

a. Construction/Up-gradation of Markets at District Level

It is targeted that through the creation of one lakh new ponds under the Mission, about 23,000 MT of fish will be produced annually, in addition to the quantity currently produced. There is a need to upgrade and modernise the existing fish markets and also construct new fish markets at each district headquarters of the state.

Though domestic markets hold huge potential, they are highly unorganised and unregulated. Most of the fish markets lack infrastructure like adequate clean water supply, drainage, waste disposal system, hygienic fish trading and cutting platforms, electricity, fish storage facility, etc.

Since shelf life of fish is limited and is a highly perishable commodity, the key marketing intervention lies in hygienic handling and preservation of its quality and freshness from the stage of catch to the stage of marketing.

A hygienic fish market must have a compound and gate, sufficient parking space, internal roads with drainage, fish unloading platform, fish auction hall with auction platforms, fish trading and cutting platforms with adequate water supply, drainage, wide walking space for consumers, washable floor and side walls, sufficient light, fans, exhaust fans, insect incinerator, ice and chilled storage facility, water and electricity supply, solid waste disposal system, effluent treatment system, etc. Contamination of fish with dirt, microbes and chemicals has to be avoided.

Given the highly perishable nature of the commodity, an effective and efficient cold supply chain management of fisheries product with a proper inter-linkage with value chain management to facilitate seamless movement of fisheries products – fresh fish from harvesters to ultimate consumers, is still to be put in place.

NFDB has taken the following initiatives to develop domestic marketing facilities.

i. Assisting state government departments for construction/modernization of hygienic wholesale/retail fish markets
ii. Assisting fisherwomen and entrepreneurs to establish hygienic fish retail outlets/retail market complexes.
iii. Assisting cold chain development and processing of value added fish products
iv. Training the fish traders, fishermen and fish farmers on hygienic handling of fish/ value addition / fish preservation, etc
v. Organization of fish festivals and fish melas for creating awareness on health benefits of fish consumption.

The Aquaculture Mission will seek the help of experts and also financial support from NFDB for structural designing of the fish markets. The Superintendent of Fisheries will identify the existing fish markets for up-gradation and modernization and also construction of new markets. In respect of new markets, they will have to negotiate with the Syiems/Nokmas/District Councils, etc for providing land free of cost for the establishment of the markets. Construction of the fish markets could be entrusted to other agencies such as MeECL, MGCC, etc. The Mission proposes to establish seven markets in the State at the rate of one in each district. The cost of establishing a market is estimated at ₹ 250 lakhs. It is

proposed to establish two markets in second year, three in the third year and two in the fourth year. The detailed cost estimates for establishing a market are shown in Table 4.10.

Table 4.10: Cost for Establishment of Fish Markets

Sl. No.	Particulars of investment	Cost (₹ lakhs)
1.	Parking space	20.00
2.	Loading & unloading facilities (5 loading platforms)	5.00
3.	Cold storage facilities 3 no. (capacity 10 tons each)	45.00
4.	Stalls with proper roofing and tiled flooring (50 nos.)	55.00
5.	Packing & transportation	7.00
6.	Ice, water & accessories (4 nos. flake ice units)	42.00
7.	Communication facilities	2.00
8.	Information system (Digital display board of available products and prices)	2.00
9.	Waste management system (Effluent treatment plants)	25.00
10.	Resting room & toilet facilities	5.00
11.	Proper drainage	10.00
12.	Water supply with overhead tank and taps	5.00
13.	Compound wall with gate for protection	10.00
14.	Canteen	7.00
15.	Miscellaneous & unforeseen costs	10.00
	TOTAL	**250.00**

b. Sale of fish in the rural markets

The existing marketing infrastructure prevalent in the rural areas will be effectively utilised in marketing of fish. The rural people buy their domestic provisions from weekly markets which are spread all over the state. It is in these weekly markets called 'haats' that the people from villages in and around congregate for all types of purchases. The Aquaculture Mission intends to facilitate the sale of fresh fish in these weekly markets through Mobile refrigerated vans, which would procure the harvested fish from aquaculture units in and around the market in the early hours of the market day and ensure their sale to the villagers in hygienic condition. One van will be supplied to each district in the third year of the Mission. The cost of each van is ₹ 25 lakhs and the total cost comes to ₹ 175 lakhs.

The Refrigerated Vans, suitably designed for transportation of fish, will prevent spoilage of fish and the un-sold fish can be preserved overnight for sale the next day. With the introduction of mobile refrigerated vans, the fish can be marketed easily without any loss to

the fish farmers, which also ensures steady supply to the local markets. Availability of fresh fish can help reduce import of fish from other states.

c. Establishing sale outlets in the selected centres of the districts

It is observed that fish festivals, occasionally conducted in the State and District headquarters, draw huge crowds vying for fresh fish. In view of this high demand for fresh fish, the Aquaculture Mission proposes to set up 20 sale outlets in any of the feasible centres spread across seven districts of the state, so that the fish harvested from the ponds of the fish farmers can be sold at these outlets. The sale outlets will be constructed in the departmental campuses in both the district and sub-division, and one deep freezer will be installed in each outlet. The sale outlets will be rented to the unemployed youth or fishery co-operative society for sale of fish as per the rate fixed by the Department, worked out covering the cost of hiring of refrigerated vans by the sale outlets. A strategy will be worked out to ensure daily supply of fish from the fish farmers to these outlets. The selection of unemployed youth/co-operative society to manage the sale outlets will be through transparent procedures. The cost of construction of sale outlet is estimated at ₹ 3 lakhs and the cost of refrigerator is ₹ 7 lakhs. The distribution of these outlets across districts is shown in Table 4.11. It is proposed to construct 20 sale outlets at a cost of ₹ 200 lakhs which includes cost of construction and cost of deep freezer.

Table 4.11: Cost of Establishment of Sale Outlets at District Level

Sl. No.	District	No. of Units			Cost (₹ Lakhs)
		2014-15	2015-16	Total	
1.	East Khasi Hills	2	2	4	40.00
2.	West Khasi Hills	1	1	2	20.00
3.	Ri-Bhoi	2	2	4	40.00
4.	Jaintia Hills	1	1	2	20.00
5.	West Garo Hills	2	2	4	40.00
6.	East Garo Hills	1	1	2	20.00
7.	South Garo Hills	1	1	2	20.00
	TOTAL	**10**	**10**	**20**	**200.00**

Construction cost ₹ 3.00 lakhs. Cost of Deep Freezer ₹ 7.00 lakhs

Each district will be provided with a refrigerated van in the third year at a cost of ₹ 25 lakhs each. The total cost of the seven refrigerated vans will be ₹ 175 lakhs at present prices. Since the purchases will be made in the third year (2014-15), necessary cost revision will have to be made at the time of purchase. The total cost of sale outlets and refrigerated vans comes to ₹ 375 lakhs.

3. Post- harvest infrastructure

Fish processing technology plays an important role in post-harvest management, as spoilage of fish begins right from the moment it is caught and netted out of the water. Fish kept under refrigeration will be fresh till it reaches the consumers. There are also other preservation technologies like freezing, sun-drying, salting, canning and fermentation which can also be employed. Since there is no surplus, there is no need for value addition through processing. However, there will be a need for value addition when the production increases substantially through the Aquaculture Mission. In the absence of this infrastructure, farmers will incur heavy losses and the activity becomes a bane. Since the farmers supported under the Mission are small and marginal, the needed infrastructure has to be created by the Mission. Three types of units can be established to handle surplus of fresh fish i.e., establishment of smoked fish units and dry fish fermentation units.

a. Establishment of MEGFISH units

A variety of fish products such as fish cutlet, fish pakora, fish momo, fish chow and fish samosa can be prepared and marketed to increase consumption. Since urban consumers are conscious of brand names, the production can take place under the brand name "MEGFISH". The Department of Fisheries, West Bengal has successfully created the brand "BENFISH", which has become popular among the consumers. It is proposed to establish four units of MEGFISH stalls in different parts of the State, particularly, in the urban areas. Entrepreneurs/ unemployed youth who are interested in taking up marketing will be assisted for selling these products, both through shops and mobile modes. This aspect will be taken up only when there is surplus and marketing of fresh fish is a problem. The unit cost of a stall is estimated at ₹ 7.44 lakhs. It is proposed to establish four units, one each in third and fourth years and two in the fifth year. The total cost is estimated at ₹ 31.36 lakhs and assistance at ₹ 18.816 lakhs. The number can be increased or decreased depending on the situation and cost norms also may have to be reconsidered at that time. The present estimate is based on the assumption that the construction cost of two rooms of 144 square feet will be ₹ 7.44 lakhs, water supply ₹ 10,000/- and ₹ 30,000/- for cooking materials and miscellaneous items.

Table 4.12: Physical and Financial Targets for Setting up MEGFISH STALLS

Year	No. of Units	Total Cost	Assistance (60%)	Own Funds (40%)
2014-15	1	7.84	4.704	3.136
2015-16	1	7.84	4.704	3.136
2016-17	2	15.68	9.408	6.272
Total	**4**	**31.36**	**18.816**	**12.544**

b. Establishing smoked fish small scale units

Smoked fish is one of the delicacies of the people of the State, particularly in the Jaintia Hills and Garo Hills districts. There are two such units in the Jaintia Hills district at the level of cottage industry. Fresh fish are brought from the local markets to these processing units for preparation of products like "Kharang" and "Khyrwong". These products are sold not only in the nearby local markets, but also in other distant markets in the State.

The traditional method adopted by the villagers is not hygienic since it is being carried out in open furnaces under thatched houses, where there is no water supply and electricity. There is need for upgradation of the smoking places, which would include construction of proper and hygienic smoking sheds, improved furnaces, overhead water tanks and other facilities.

It is proposed to establish 18 small scale units spread across the state, in addition to upgrading the existing two units at Jaintia Hills. The unit cost of this industry is ₹ 7 lakhs. It consists of two components – construction of smoking shed including furnace, smoking grills, over-head water tank and drain canal at a cost of ₹ 6.55 lakhs and construction of 0.05 hectare pond at a cost of ₹ 0.45 lakh for rearing of catfish. For the up-gradation of the two existing units, an amount of ₹ 7 lakhs is allocated. However, sanction will made only after assessing the actual requirement of funds for up-gradation. The total cost of establishing 18 new units and up-gradation of two units comes to ₹ 133.00 lakhs, of which ₹ 79.80 lakhs will be assistance.

Table 4.13: Physical and Financial Targets for Setting up Smoked Fish Cottage Industry

Year	No. of Units	Total Cost	Assistance (60%)	Own Funds (40%)
2013-14	2	7.00	4.20	2.80
2014-15	3	21.00	12.60	8.40
2015-16	8	56.00	33.60	22.40
2016-17	7	49.00	29.40	19.60
Total	**20**	**133.00**	**79.80**	**53.20**

c. Dry fish fermentation

In Meghalaya, traditional foods like "Tungtap" in Khasi Hills and "NA.kam" in Garo Hills are famous and fetch a high price. Fermentation has the added advantages of enhancing flavour, increasing digestibility and improving nutritional value. The cost of establishing a unit is ₹ 37 lakhs. At present, there are six dry fish fermentation centres in Khasi Hills. It is proposed to establish 20 more centres in the state by extending financial assistance to the small entrepreneurs. The total cost of establishing these units is ₹ 740 lakhs of which ₹ 444 lakhs will be assistance and ₹ 296 lakhs will be the investment of the entrepreneur.

Table 4.14: Physical and Financial Targets for Setting up Dry Fish Fermentation Centres

Year	No. of Units	Total Cost	Assistance (60%)	Own Funds (40%)
2013-14	8	296.00	177.60	118.40
2014-15	5	185.00	111.00	74.00
2015-16	4	148.00	88.80	59.20
2016-17	3	111.00	66.60	44.40
Total	**20**	**740.00**	**444.00**	**296.00**

4. Technology Induction

Several technologies developed by research institutes in India are yet to be adopted in the field. Many of these technologies and practices are to be demonstrated to potential users. In order to assess these technologies and determine their appropriateness for the fish farmers of the state, pre-commercialisation field testing and analysis has to be done.

Some of the major technologies to be tested and inducted are:

a. Diversification in aquaculture by bringing in more potential fish species and varied cultural systems in freshwater fish farming.
b. Breeding and culture of high value fish species
c. Ornamental fish breeding and farming
d. Breeding and culture technologies for potential coldwater fish species
e. Organic aqua farming
f. Pen and cage culture technology in reservoirs and wetlands
g. Technology for live feed organisms
h. Fish health management
i. Eco-friendly fishing technologies for harnessing sustainable fishery from the reservoirs
j. Fishing equipments for harvest and post harvest operations

A few technology applications from the above list will be implemented in a phased manner. They will be tested in the production systems of the farmers for technical feasibility and environmental, social and economic benefits. Demonstrations of these technologies will be conducted in the farmers' ponds. Technology related workshops will be organized for farmers and officers. One National Workshop will be organised every year for deliberating on the possibilities and potential for inducting emerging technologies in the state. Technology transfer packages including manuals, videos and model promotional campaigns will be produced. Technology incubation centres for popularization and commercialization of technologies will be also examined in due course of time.

4.8 Creation and Strengthening of Fishery and Multi-purpose Co-operatives

There are 65 Fishery Co-operative Societies (FCS) with a membership of 2129 and 445 Multi-purpose Co-operative Societies (MPCS) with a membership of 10640. But some of them (18 FCS and 51 MPCS) are dormant and the remaining societies are functioning. The performance of FCSs in the State, with a few exceptions, has become suboptimal over the years due to the following reasons.

1. The members do not have the technical knowledge of aquaculture and the extension services have been inadequate.
2. Quality inputs (fingerlings and feed) are not available.
3. Money provided by the Co-operative Department towards share capital is inadequate for area expansion and related activities and Societies have not been able to mobilize credit.
4. Societies have become secretary-centric as members lack in cooperative spirit.

1. Involving Co-operatives in MSAM

The MSAM aims at strengthening these co-operatives by engaging them in activities of various Mini Missions. Some of the well performing FCS and MPCS can be involved in the following modes.

1. The Societies with good performance, strong balance sheets and potential to leverage credit or commit own funds could be supported to take up setting up of feed mills and hatcheries.
2. They would be very effective in door delivery of services and marketing.
3. Societies which are already doing aquaculture in small way can be supported to increase the scale of operation and those which are located in high potential areas and interested in starting aquaculture could be encouraged under the Mission.
4. Both MPCSs and FCSs could be important partners in Mini Mission III which aims at establishing sanctuaries for conservation of indigenous and endemic species of fish. This will be easier for Societies which have membership from a single village with coverage of all the households in the village.
5. The activities relating to technology induction can be entrusted to the FCS and MPCS which are strong in activities pertaining to aquaculture.
6. Orientation workshops under Mini Mission III can be successfully organized by these cooperatives. Preference can be given to cooperatives for organizing training programmes and workshops.

2. Procedural Framework for Partnering with FCS and MPCS

1. FCS and MPCS will be provided assistance for area expansion through community fish ponds (under Mini Mission I), for setting up of feed mills and hatcheries (under Mini Mission II) and for establishing fish sanctuaries (under Mini- Mission III). There will

however be no bar on individual cooperative members applying for individual ponds under Mini Mission I.

2. The office of the Registrar of Cooperative Societies (RCS) will recommend the FCS and MPCS for assistance under the Mission. The recommendation will be based on the scrutiny of their performance, credit worthiness, land availability, presence of cooperative spirit and an assessment of the potential for development of fisheries.
3. Scrutiny of the recommended societies will be done by the FFDA from the technical point of view and the list of societies to be assisted under different Mini Missions will be finalized.
4. Assistance to the societies will be channelized through the office of the RCS which will be responsible for execution of the projects. However, technical assistance for planning and execution will be provided by the FFDA.
5. One officer in each district/sub division and two from the headquarters of the cooperation department will be notified as nodal officers with responsibility for implementation of the projects. The notified officers will be trained in all aspects of the aquaculture by the FFDA and will continuously liaise with the fishery officers in the field to ensure that the FCS/MPCS will get all possible assistance for successful completion of projects.
6. The cooperation department will provide share capital contribution to the selected Societies from the state plan schemes thus contributes for achieving schematic and resource convergence.

3. Forming and Nurturing of New Fishery Co-operative Societies

Cooperative spirit is inherent in village communities in the State of Meghalaya. But it is not translated into the establishment of Fishery Co-operative Societies. There are only 65 FCS in the entire State. The MSAM will provide support at the rate of ₹ 10.00 lakhs to each for the formation of 150 new FCS. The total cost will be ₹ 1500.00 lakhs.

4. Projection of Financial Requirement

The targets for area expansion through community fish ponds for the first two years of the MSAM via 2012-13 and 2013-14 are presented in Table 4.15. The total area proposed for development of community ponds is 143 hectares out of which 91.0 hectares will be developed by the FCS and the remaining 52 hectares by the MPCS. The total cost is ₹ 715.00 lakhs of which subsidy is ₹ 429.00 lakhs. The balance will be invested by the respective societies partly from own funds and partly from the loans provided by the commercial banks (Table 4.15).

Table 4.15: Proposals for Area Expansion through Community Ponds (1st and 2nd Years)*

S. No.	District	No. of Societies		Total Area Proposed (hec.)			Sources of Funds (₹ Lakhs)			
		FCS	MPCS	FCS	MPCS	Total	Subsidy	Loan	Own	Total
1.	EKH	6	10	15	10	25	75.00	31.25	18.75	125.00
	Sohra	3	2	6	4	10	30.00	12.50	7.50	50.00
2.	WKH	5	10	10	10	20	60.00	25.00	15.00	100.00
	Mawkyrwat	8	5	16	4	20	60.00	25.00	15.00	100.00
3.	RB	3	10	6	10	16	48.00	20.00	12.00	30.00
4.	JH	2	2	4	2	6	18.00	7.50	4.50	30.00
	Amlarem	5	2	10	4	14	42.00	17.50	10.50	70.00
5.	WGH	4	2	8	4	12	36.00	15.00	9.00	60.00
6.	EGH	5	2	10	2	12	36.00	15.00	9.00	60.00
7.	SGH	3	2	6	2	8	24.00	10.00	6.00	40.00
	Total	**44**	**47**	**91**	**52**	**143**	**429.00**	**178.75**	**107.25**	**715.00**

*This item is shown under Mini Mission I in Chapter III.

The Societies will establish 12 feed mills at a unit cost of ₹ 18 lakhs. The allocation of feed mills to districts is shown in Table 4.16. Each district will get one feed mill in the first year. In the second year five districts, excluding East Garo Hills and South Garo Hills will get one each. The total cost of setting up the feed mills is ₹ 216.00 lakhs and subsidy comes to ₹ 129.00 lakhs.

Table 4.16: Proposals for Establishment of Feed Mills (1st and 2nd Years)

Sl. No.	District/ Subdivision	2012-13	2013-14	Total	Subsidy	Loan	Own	Total
1.	EKH	1	1	2	21.60	9.00	5.40	36.00
2.	WKH	1	1	2	21.60	9.00	5.40	36.00
3.	RB	1	1	2	21.60	9.00	5.40	36.00
4.	Amlarem SD	1	1	2	21.60	9.00	5.40	36.00
5.	WGH	1	1	2	21.60	9.00	5.40	36.00
6.	EGH	1	-	1	10.80	4.50	2.70	18.00
7.	SGH	1	-	1	10.80	4.50	2.70	18.00
	Total	**7**	**5**	**12**	**129.60**	**54.00**	**32.40**	**216.00**

It is proposed to establish 10 hatcheries in the co-operative sector. The total cost of establishment will be ₹ 160 lakhs and an amount of ₹ 96 lakhs will be provided by the MSAM in the form of subsidy. The district-wise allocation of hatcheries and the cost are shown in Table 4.17.

Table 4.17: Proposals for Establishment of Hatcheries (1st and 2nd Years)

Sl. No.	District/ Subdivision	2012-13	2013-14	Total	Subsidy	Loan	Own	Total
1.	EKH	1	-	1	9.60	4.00	2.40	16.00
2.	Sohra SD	-	1	1	9.60	4.00	2.40	16.00
3.	Mawkyrwat SD	1	-	1	9.60	4.00	2.40	16.00
4.	RB	1	1	2	19.20	8.00	4.8	32.00
5.	Amlarem SD	1		1	9.60	4.00	2.40	16.00
6.	WGH	1	1	2	19.20	8.00	4.8	32.00
7.	EGH	1	-	1	9.60	4.00	2.40	16.00
8.	SGH	1	-	1	9.60	4.00	2.40	16.00
	Total	**7**	**3**	**10**	**96.00**	**40.00**	**24.8**	**160.00**

The co-operatives will also be supported to establish 20 FRP portable hatcheries. The unit cost of FRP hatchery will be ₹ 2.34 lakhs. The allocation of these units for districts and sub-divisions is shown in Table 4.18. The total cost is ₹ 46.80 lakhs and subsidy comes to ₹ 28.08 lakhs.

Table 4.18: Proposals for Establishment of FRP Hatcheries (1st and 2nd Years)

District/ Subdivision	2012-13	2013-14	Total	Subsidy	Loan	Own	Total
EKH	1	1	2	2.808	1.170	0.702	4.68
Sohra SD	-	1	1	1.404	0.585	0.351	2.34
WKH	-	1	1	1.404	0.585	0.351	2.34
Mawkyrwat SD	2	1	3	4.212	1.755	1.053	7.02
RB	1	1	2	2.808	1.170	0.702	4.68
Amlarem	1	1	2	2.808	1.170	0.702	4.68
WGH	2	2	4	5.616	2.340	1.404	9.36
EGH	2	1	3	4.212	1.755	1.053	7.02
SGH	1	1	2	2.808	1.170	0.702	4.68
Total	**10**	**10**	**20**	**28.08**	**11.70**	**7.02**	**46.80**

The co-operative sector will also participate in establishing seven sanctuaries at a cost of ₹ 70 lakhs of which ₹ 42 lakhs will be the subsidy. The locations for sanctuaries will be identified later.

The co-operatives which are strong financially and which have good infrastructural facilities will also be engaged in technology induction, capacity building and processing and marketing activities. Though separate allocations are not shown here for some of these components, co-operatives will be given first preference before private individuals for any of the MSAM activities. The financial allocation presently made for co-operatives is only tentative and minimum and reallocation will be made when the co-operatives come forward with viable proposals for other components.

The total cost of the activities allocated to the co-operative sector comes to ₹ 2707.80 lakhs and the subsidy part comes to ₹ 2224.68 lakhs. The cooperatives are expected to contribute ₹ 181.17 lakhs from their own funds. This assistance from the MSAM includes the support for establishing 150 fishery co-operative societies. There are many activities which are not included in the present allocation like processing units, marketing of fish and organization of workshops and training programmes. The societies which have capabilities to take up those activities can approach the MSAM through the Registrar of Co-operatives.

The total cost of critical infrastructure development which comes under Mini Mission II (Table 4.19), is ₹ 6601.74 lakhs. Out of this total amount, bank loan is only ₹ 273.25 lakhs. The entrepreneurs have to contribute ₹ 605.69 lakhs. The balance amount of ₹ 5722.80 lakhs will be contributed by the MSAM. It should be noted that the share of the MSAM is very high at 86.7 per cent and the loan component is minimal at 4.1 per cent. The contribution of the entrepreneurs is 9.2 per cent. This high contribution of the MSAM is because of the nature of the activities in the Mission. For many activities, the Mission does not take the responsibility of providing the loans. In contrast to this, the MSAM will take the responsibility of arranging bank loan to the individual pond construction. However, some part of the own funds shown in this Mission may come from bank loans without any guarantee from the MSAM.

Table 4.19: Cost of Critical Infrastructure Development

Item	Source of Fund	2012-13	2013-14	2014-15	2015-16	2016-17	Total
Departmental Farms	Number	3	2	2	2	3	11
	Assistance	650.00	450.00	480.00	310.00	350.00	2240.00
	Loan	-	-	-	-	-	-
	Own	-	-	-	-	-	-
	Total	**650.00**	**450.00**	**480.00**	**310.00**	**350.00**	**2240.00**

Item	Source of Fund	2012-13	2013-14	2014-15	2015-16	2016-17	Total
Private Hatcheries	Number	7	3	3	2	-	15
	Assistance	67.2	28.8	28.8	19.2	-	144.0
	Loan	28.0	12.0	12.0	8.0	-	60.0
	Own	16.8	7.2	7.2	4.8	-	36.0
	Total	**112.0**	**48.0**	**48.0**	**32.0**	**-**	**240.0**
Portable FRP Hatcheries	Number	20	20	15	15	7	77
	Assistance	28.08	28.08	21.06	21.06	9.828	108.108
	Loan	11.7	11.7	8.775	8.775	4.095	45.045
	Own	7.02	7.02	5.265	5.265	2.457	27.027
	Total	**46.8**	**46.8**	**35.1**	**35.1**	**16.38**	**180.180**
Feed Mills	Number	2	2	2	2	2	14
	Assistance	21.60	21.60	21.60	21.60	21.60	108
	Loan	9.00	9.00	9.00	9.00	9.00	45
	Own	5.40	5.40	5.40	5.40	5.40	27
	Total	**36**	**36**	**36**	**36**	**36**	**180**
Laboratories	Number	2	-	-	-	-	2
	Assistance	25.2	11.2	11.2	11.2	11.2	70.0
	Loan	-	-	-	-	-	-
	Own	-	-	-	-	-	-
	Total	**25.2**	**11.2**	**11.2**	**11.2**	**11.2**	**70.0**
Markets	Number	-	-	-	2	-	2
	Assistance	-	-	-	500.0	-	500.0
	Loan	-	-	-	-	-	-
	Own	-	-	-	-	-	-
	Total	**-**	**-**	**-**	**500.0**	**-**	**500.0**
Refrigerated Vans	Number	-	-	7	-	-	7
	Assistance	-	-	175	-	-	175
	Loan	-	-	-	-	-	-
	Own	-	-	-	-	-	-
	Total	**-**	**-**	**175**	**-**	**-**	**175**
Sale Outlets	Number	-	-	10	10	-	20
	Assistance	-	-	10.0	10.0	-	20.00
	Loan	-	-	-	-	-	-
	Own	-	-	-	-	-	-
	Total	**-**	**-**	**10.0**	**10.0**	**-**	**20.00**

Item	Source of Fund	2012-13	2013-14	2014-15	2015-16	2016-17	Total
MEGFISH Stall	Number	-	-	1	1	2	4
	Assistance	-	-	4.704	4.704	9.408	18.816
	Loan	-	-	-	-	-	-
	Own	-	-	3.136	3.136	6.272	12.544
	Total	**-**	**-**	**7.84**	**7.84**	**15.68**	**31.36**
Smoked Fish	Number	-	2	3	8	7	20
	Assistance	-	4.2	12.6	33.6	29.4	79.8
	Loan	-	-	-	-	-	-
	Own	-	2.8	8.4	22.4	19.6	53.2
	Total	**-**	**7.00**	**21.0**	**56.0**	**49.0**	**133.0**
Dry Fish Fermentation	Number	-	8	5	4	3	20
	Assistance	-	177.6	11.0	88.8	66.0	343.4
	Loan	-	-	-	-	-	-
	Own	-	118.4	74.0	59.2	44.4	296.0
	Total	**-**	**296.0**	**185.0**	**148.0**	**110.4**	**639.4**
Technology Induction	Number	2	2	2	2	2	10
	Assistance	24.0	24.0	24.0	24.0	24.0	120.0
	Loan	-	-	-	-	-	-
	Own	16.0	16.0	16.0	16.0	16.0	80.0
	Total	**40.0**	**40.0**	**40.0**	**40.0**	**40.0**	**200.0**
Coop Sector Feed Mills	Number	7	5	-	-	-	12
	Assistance	75.6	54.0	-	-	-	129.6
	Loan	31.5	22.5	-	-	-	54.0
	Own	18.9	13.5	-	-	-	32.4
	Total	**126.0**	**90.0**	**-**	**-**	**-**	**216.0**
Coop Sector Hatcheries	Number	7	3	-	-	-	10
	Assistance	67.2	28.8	-	-	-	96.0
	Loan	28.0	12.0	-	-	-	40.0
	Own	16.8	7.2	-	-	-	24.0
	Total	**112.0**	**48.0**	**-**	**-**	**-**	**160.0**
Coop Sector FRP Hatcheries	Number	10	10	-	-	-	20
	Assistance	14.04	14.04	-	-	-	28.08
	Loan	5.85	5.85	-	-	-	11.70
	Own	3.51	3.51	-	-	-	7.02
	Total	**23.40**	**23.40**	**-**	**-**	**-**	**46.80**

Item	Source of Fund	2012-13	2013-14	2014-15	2015-16	2016-17	Total
Coop Sector Formation of new FCS	Number	20	30	30	35	35	150
	Assistance	200	300	300	350	350	1500
	Loan	-	-	-	-	-	-
	Own	-	-	-	-	-	-
	Total	**200**	**300**	**300**	**350**	**350**	**1500**
Coop Sector Sanctuaries	Number	-	2	2	2	1	7
	Assistance	-	12.0	12.0	12.0	6.0	42.0
	Loan	-	5.0	5.0	5.0	2.5	17.5
	Own	-	3.0	3.0	3.0	1.5	10.5
	Total	**-**	**20.0**	**20.0**	**20.0**	**10.0**	**70.0**
All Components*	**Assistance**	**1172.92**	**1154.32**	**1111.96**	**1406.16**	**877.44**	**6222.80****
	Loan	**114.05**	**80.06**	**34.78**	**30.78**	**15.60**	**273.25**
	Own	**84.43**	**184.03**	**122.40**	**119.20**	**95.63**	**605.69**
	Total	**1371.40**	**1416.40**	**1269.14**	**1556.14**	**988.66**	**7107.74**

* The cost of area expansion by the co-operative sector is not included in the item 'All Components' as it is already shown in Mini Mission I.

** An amount of ₹ 500.00 lakhs is included for inducting Israeli Technology

4.9 Summary and Conclusions

The Mission has the goal of achieving growth with social justice. The success of this pro-poor strategy depends on the development of the critical infrastructure as the beneficiaries are all marginal and small farmers. Seed, feed, health care and market are the crucial items for the development of fishery sector.

The availability of fingerlings is the most important item because there are no hatcheries in the private sector and the departmental hatcheries need repairs and modernisation to supply fingerlings in enough quantities. Fingerlings are presently procured from Assam and a high mortality is occurring due to long travel in an undulated terrain. The initial shortage of fingerlings is estimated at 160 lakhs and the Mission will generate demand for another 119 lakhs in the first year. The total requirement of fingerlings in the first year comes to 350 lakhs. The annual requirement of fingerlings increases at 220 to 270 lakhs per year. The requirement by the end of the Mission reaches nearly 1400 lakhs per year because there is likely to be growth of the sector outside the Mission activities also.

The departmental farms numbering 17 will be modernised to achieve the production capacity of about 400 lakhs fingerlings from the present level of 30 lakhs. The work of modernisation

is already under way through RKVY and BRGF funds and the gaps and balance of work will be taken up by the Mission on a priority basis.

The private sector will be supported by way of assistance of 60 per cent and bank loan of 25 per cent to supply 10 crore fingerlings annually by the end of the Mission. The Mission will support 15 private hatcheries and 77 private portable FRP hatcheries. The cost of private hatchery is ₹ 15 lakhs and that of FRP hatchery is ₹ 2.34 lakhs. It is estimated that private hatcheries supply 500 lakhs and FRP hatcheries 770 lakhs fingerlings annually by the end of the Mission.

The second critical input is feed and it determines the productivity of the ponds constructed under the Mission. The present level of feeding is very low at 1.0 MT per hectare. However, by changing the practices of the farmers, it is expected to increase to 1.5 MT per annum, 1.00 MT of bran and 0.5 MT of oil cake. The total feed requirement comes to 16,500 MT (11000 MT of bran 5500 MT of oil cake) by the end of the Mission. In view of the large increase in fish production which comes to four times the present level, there is a danger that feed availability may become a serious constraint in the State. If there is a need to import feed from other parts of the country, it is advantageous to import feed ingredients rather than the processed feed so that economic activity will be developed in the State.

In order to develop entrepreneurship in the feed sector, the Mission will introduce small feed manufacturing units with a capacity of 0.5 MT per day. The Mission will support 26 feed mills. The cost of the feed mill comes to ₹ 18 lakhs and it will produce about 150 MT in a year. The expansion may take place only after proper evaluation of the existing feed mills. As in the case of other private investment, this component will also provide 60 percent loan and 25 percent assistance. As the farmers have to shift to the compound feed, preference will be given to Fishery Cooperatives and SHGs for the establishment of feed mills so that the feed produced will be directly available to the farmers.

The third input is the health care and it is completely lacking at present. The productivity of the sector is determined partly by feeding and partly by health care. But they are not independent. Poor feeding is the result rather than the cause of mortality. Two laboratories, one in Khasi Hills and one in Garo Hills will be established at a cost of ₹ 25.2 lakhs which includes capital cost as well as the operational cost for the first year. The total cost for all the five years comes to ₹ 70 lakhs. These laboratories will provide free diagnostic services and the cost of treatment has to be borne by the farmers.

The Mission will also make investment in post-harvest management. The Mission proposes to establish seven markets at a unit cost of ₹ 250 lakhs. Besides this, the Mission will also provide 20 fish sale outlets at a unit cost of ₹ 10 lakhs each.

The Mission will encourage the progressive farmers to adopt some of the modern technologies evolved and tested at the laboratory level and monitor the effectiveness of these

technologies. It will organize seminars and workshops to build awareness and make them accept and adopt some of the modern technologies. Several awareness campaigns through mass media will be organized.

When a Mission is launched to work for a specific period, it should see that the achievements are sustainable. For this institutions should be strengthened. One such institution is fishery cooperatives. They will be made financially viable and entrusted with some of the activities relating to critical infrastructure development. For instance, hatcheries, feed mills and fish processing units can be given to strong cooperatives so that the intermediary between demand and supply namely, the market can be avoided.

The total cost of this Critical Infrastructure Mini Mission-II is estimated tentatively at ₹ 8362.31 lakhs. The actual expenditure will be based on the estimates revised due to cost escalation or more accurate information. The Mini Mission-II will get the support of an economist to check the economic viability of the investments to be made as any wrong investment will result in huge loss of scarce resources.

Chapter V

Mini Mission - III

Establishing sanctuaries for conserving indigenous and endemic species

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The importance of mahaseer as a world-famous sport fish is well known. 'Chocolate mahaseer' (*Neolissocheilus hexagonolepis*) followed by 'Golden mahaseer' (*Tor putuitora*) are the two predominant indigenous species of Meghalaya. Of late, a significant decline has been observed in most of their natural habitats. Mass killing of brood fish and juveniles by the use of dynamite, bleaching powder, pesticides, local herbs, electric current and other destructive methods has been one of the major reasons for the reduction of mahaseer population. The fish migrate upstream for spawning, feeding, and descend back after spawning. During both the phases of migration, the gravid and spent fish are killed due to adoption of illegal fishing methods. Their breeding ground comprising of stones, gravel, etc. have been replaced by large boulders, debris, silt, river pollution, resulting in destruction of spawning grounds of this group of fishes.

A Confluence of Umtrew & Umraleng Rivers in Ri-Bhoi District

To save the species from further decline, it is the need of the hour that strict conservation measures have to be adopted and this will be one of the major tasks of the "State Aquaculture Mission". Conservation is important at least for four reasons viz.,

(a) The species indigenous to the state are the wealth of the state and they require to be preserved for posterity

(b) They are also highly valuable food fish

(c) They form a source of livelihood for many fishers

(d) They offer a great potential as sport fish for promotion of Aqua-tourism.

5.1 Surveys for identifying the endangered species

For evolving a sound rehabilitation policy, surveys for identifying the endangered species, comprehensive information on fish resources, stock structure, production trends, natural habitat and exploitation pattern will have to be collected. The services of Programme Managers in collaboration with the respective DEOs of the Department will be utilised for this purpose. Initially, locations of the rivers, streams, etc. where surveys for identification of the endangered species have to be conducted will be listed out. Permission from the local headman, sirdar, nokma, etc. will be obtained for camping of the officials on the site during the survey. An awareness programme with the village authorities to brief them of the purpose of the survey will be conducted and the service of local guides will be utilised. Sample netting of the available stock will be done by using fishing craft and gears. Other items such as camping tents, cameras, polythene bags, sleeping bags, oxygen cylinders, etc. will also be needed. The local people will also be approached to provide the necessary information about the available stock of the indigenous species.

5.2 Media campaigns specific to conservation

People are to be made aware of the importance of biodiversity in general and conservation of indigenous and endemic species in particular. Through the Aquaculture Mission, various components of mass media campaign will be intensively used to sensitize the people about its objectives. This would cover public meetings, poster campaign, slogans, distribution of pamphlet/leaflets, advertisement/press releases published in Khasi, Garo and English newspapers, press conference, press conducted tours, radio broadcasting, television telecast, outreach programme for mass mobilization, competitions for school children, onstage/live campaign, newsletter, etc.

1. Public Meetings

The functionaries of the Aquaculture Mission will organise a series of meetings with the Village authorities/NGOs/Voluntary organisations/Public etc. specially in selected strategic locations where conservation of the species is in need. The idea is to make them understand the importance of conservation of the indigenous species and seek their support as well as their involvement in this endeavor of the Mission. It is a fact that some NGOs with the support of the Department have taken up conservation programmes prohibiting indiscriminate killing of fish in certain parts of the rivers/streams. However, as random killing of the species by dynamiting, poisoning etc. still continues, intensive campaign is the need of the hour to motivate people for their active involvement. Such meetings will be organised in the cluster of villages, specially those situated near the rivers/streams. Specialists in this subject will be invited as resource persons.

2. Poster Campaigns

Posters will also act as another canvassing tool to promote the objective of the Mission with regards to conservation. Display of specially designed posters will be used extensively in mobilising the people's perceptions and to attract their attention. Services of the local youth will be obtained for this purpose. Environmental groups will also be involved in designing and producing posters for the purpose.

3. Slogans

Slogans with catchy messages, concerning conservation of the natural fish fauna would be prepared and used at various strategic locations of the state. Competitions for best slogans will also be organized involving school and college students.

4. Distribution of pamphlets/leaflets

Leaflets/Pamphlets with specific description will be designed and distributed to the people at large. The message is to induce the people to join hands in tackling the social menace of dynamiting, poisoning, etc. and come forward in conservation of our natural wealth.

5. Advertisement/Press Release

The goals/objectives of conserving indigenous and endemic species and actions taken on conservation will be regularly made available to the people through advertisements/press releases which will be organized on a quarterly basis.

6. Press Conference

Periodical press conference to highlight the objectives, progress made and the efforts taken by the Department in relation to conservation will be organised quarterly. The local news channels of electronic media would be approached to telecast the successful projects etc. in order to mobilize the interest and spirit of people at large.

7. Press Conducted Tours

Journalists, correspondents and reporters of various newspapers and cable channels will be invited to visit areas where conservation of indigenous and endemic species is being done. Such press conducted tours would facilitate in the scaling up of the efforts which will ultimately trigger other villages to come forward to take up this programme in their respective areas.

8. Radio Broadcasting

Radio broadcasting is a one-way wireless transmission intended to reach people at large. It can carry out essential information to much wider audience and is more viable as it is a much cheaper medium with low production costs and requiring minimum resources. Audio broadcasting also can be done via cable radio, local wire television networks, F.M. radio, and internet radio via streaming media on the Internet. The medium of radio broadcast will be effectively utilized to disseminate the message of conservation among the public at large.

9. Telecast through TV

In a country like ours, with a large illiterate population, television is an ideal instrument for transmitting social messages. Television also has a very wide range, output and reach. Realising its importance, the Mission plans to use this medium in a massive way. The following components are likely be telecast frequently by various local channels of television media.

a. Preparation of educational documentary films showing successful conservation programmes taken up by organisations like Nongbareh (Jaintia Hills), Rombagre (West Garo Hills), etc. Such programmes will create an impact on the minds of the people to take up such activities in their respective areas as well.

b. Periodical telecasting of the documentary films relating to the conservation and preservation of indigenous species of fishes would be undertaken to mobilize the people's opinion on the commercial value of such species.

10. Competitions for School Children

Organizing competitions for the school children on the importance of conservation of indigenous and endemic species is an important method for creating awareness among the school children who would be faster propagators of information. Competitions will be through essay writing, poetry, debates and stories on the subject. This would facilitate mass awareness among the school children on the importance of indigenous species of fishes and their conservation for protecting the environmental degradation.

11. Onstage/Live Campaigns

Songs, dramas and street plays are forms of traditional media and are a part of our culture. Songs and dances are traditional forms of media which inform, educate and entertain people. The Mission intends to make use of this traditional media as a mass mobilization tool by engaging local artists to perform the plays, song and dance sequences etc. on the theme of conservation, which will be one way of publicizing the message of conservation.

12. Newsletters

Newsletter will be regularly published about conservation that will be of interest to the readers. These will be published at periodic intervals and would help to create mass awareness about the events, action taken by the Mission in respect of conservation.

5.3 Orientation workshops for the villages with potential

As the position stands today, major portion of the people in the rural areas are yet to realize the importance of conservation. The knowledge on the need of conserving the biodiversity in general and aquatic life in particular can be disseminated to the village folk through orientation workshops. These workshops will be organised in the villages where potential areas exist for taking up conservation programme. Organising such workshops would be

undertaken where each centre will cater to a cluster of villages. The Village Authorities/NGOs/Self-Help Groups/Fishing Association etc. will be invited to attend. Experts from within the institution of state and from other reputed institutions viz. Directorate of Cold Water Fisheries Research, Bhimtal, CIFA, NFDB, ICAR, CIFRI, CIFT, etc. would be invited to participate and contribute. This would enrich the knowledge, understanding of the rural folks on the importance of taking up conservation programme in rivers/streams etc. within their respective villages. Communities are the guardians of the rivers/streams etc. of the state and it is only through their active participation and involvement that this programme will succeed. This can be achieved by holding a series of orientation workshops at the village level.

5.4 Development of the sanctuaries

Sanctuary is a place of safety, a nature's reserve or a place where endangered, threatened and vulnerable are cared for. In a fish sanctuary, fishing of any kind is prohibited. Some bodies of water or a portion of them can be declared as fish sanctuaries. Under the Aquaculture Mission, sanctuaries will be created in all the potential water bodies with the active involvement of the communtities/village authorities etc.

Creation of fish sanctuaries will be in the deepest parts of the river having pockets of water pools, less probability of siltation, free from human interference, poaching, etc. Adequate measures such as marking the selected site with distinguishable symbols will be taken up. Assistance from the experts will be drawn during the site selection. If necessary, small artificial dams/mini barrage will be constructed to raise the water level where such programmes are proposed to be developed.

Sanctuaries to be created under the Mission will be for conservation of mahseer and other indigenous and endemic species of the state. The objective of such sanctuaries will be for enhancing and preserving aquatic biodiversity, provide breeding and feeding grounds, protect the species from genetic pollution, increasing the abundance of threatened fish species, restoration of the diminishing stock and meet the expectation of the people of the state. Sanctuaries are known to attract tourists which will eventually benefit the rural people and improve their livelihood conditions through the visits of the tourists to these sanctuaries.

The River Guards of the state Department of Fisheries will be deployed to protect these sanctuaries all time of the year wherever necessary. Otherwise, it is expected that the villagers themselves will provide for the upkeep and maintenance of these sanctuaries. In addition, local youths will also be deployed to act as watch and ward at strategically important sites, breeding pockets and confluences during the breeding or migration season of the fish. It is important to put a halt to the large scale killing during the migratory journey of the species, failing which all efforts to conserve the species would be in vain.

Investment on the creation of sanctuaries viz. procurement of fish seeds, construction of watch towers, construction of barrage, approach roads, camping tents and other equipments will be made through the Mission. On completion, these sanctuaries will be handed over to the interested NGOs/Self Help Groups/Communities etc. for management who would run them in conformity with conditions laid down by the Department.

Table 5.1: Budget details for conserving of indigenous and endemic species

(₹ Lakhs)

S. No.	Particulars of Investment	Total number of surveys/documents reports/displays/trips etc. for 5 years	Event/year	Anticipated cost/event	Total cost for 5 years	
					First year of implementation	Remaining 4 years of implementation
1.	**Surveys for identifying the endangered species**	250 nos. in all the 7 districts	50 nos.	0.20	10.00	40.00
2.	**Media campaigns specific to conservation**					
	a. Public Meetings	200 centres/locations in all the 7 districts	40 nos.	0.50	20.00	80.00
	b. Poster Campaigns	200 centres/locations in all the 7 districts	40 nos.	0.10	4.00	16.00
	c. Slogans	200 centres/locations in all the 7 districts	40 nos.	0.10	4.00	16.00
	d. Distribution of pamphlets/leaflets	15,000 nos. in 3 languages (English, Khasi & Garo)	3000 nos.	0.60	0.60	2.40
	e. Advertisement/Press Release	20 times	4 times	0.50	2.00	8.00
	f. Press Conference	20 times in Shillong	4 times	0.25	1.00	4.00
	g. Press Conducted Tours	35 times in all districts	7 times	0.50	3.50	14.00
	h. Radio Broadcasting	20 times	4 times	0.10	0.40	1.60
	i. Television Telecast	20 times	4 times	0.75	3.00	12.00
	j. Competitions for School Children	39 times i.e. in all the blocks	8 times	0.10	0.80	3.20

S. No.	Particulars of Investment	Total number of surveys/documents reports/displays/trips etc. for 5 years	Event/year	Anticipated cost/event	Total cost for 5 years	
					First year of implementation	Remaining 4 years of implementation
	k. Onstage/Live Campaign	39 times i.e. in all the blocks	8 times	0.50	4.00	16.00
	l. Newsletters	20 times	4 times	0.10	0.40	1.60
3.	**Orientation workshops for the villages with potential**	40 centres/locations/ villages	8 times	0.80	6.40	25.60
4.	**Development of the sanctuaries**	200 nos.		5.00 lakh/ sanctuary	200.00	800.00
Total					**260.10**	**1040.40**
Grand Total						**1300.50**

Chapter VI

Mini mission - IV

Capacity Building and Human Resource Development

Capacity building refers to the strengthening of the skills, competencies and abilities of the stakeholders so they can perform their tasks effectively. The successful execution of the various components of the Aquaculture Mission will call for systematic building of the competencies of various stakeholders to the required degree. The Mission intends to enhance the capacities of human resources for aquaculture practices, viz., 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

6.1 Building the capacities of the stakeholders

Capacity building can take place at an individual level, institutional level and at the societal level. Though capacity building is mostly focussed on the individuals, the other two levels are equally important.

Training at CIFA, Bhubaneswar

At the individual level, there are two categories of people to be considered for capacity building, viz., Departmental officials and fish farmers. The capacity building of the officials is very critical for the successful implementation of the Mission. The officials will have to be provided technical training relating to modern aquaculture practices and emerging technologies so they become abreast with the recent advances in the fisheries sector. They will also be exposed to national level fisheries institutes in the country.

At the societal or community level, the Mission proposes three capacity building interventions, viz., **i) Mass mobilization campaign to make the people aware of the components of the Mission, (ii) Orientation programmes for the potential fish farmers**

(registered farmers during the mobilization campaign) for initiating them into the Mission and iii) Orientation workshops for the farmers/village communities desirous of creating fish sanctuaries. The State has some precious fish sanctuaries. However, the scope for creating more fish sanctuaries does exist since the state has a river length of 5600 K.M. Of late, some enlightened farmer groups and village communities have come forward with proposals for creating fish sanctuaries in their localities. Such groups of farmers /village communities have to be provided knowledge on the various conservation measures.

1. Training and exposure visits for Officers

i) The Officers will be provided technical training on thematic topics as below:

a. Hatchery management – CIFA, Bhubaneswar/ CIFRI, Barrackpore
b. Feed technology – CIFA, Bhubaneswar
c. Fish processing technology- CIFT, Cochin
d. Ornamental fisheries- CIFA, Bhubaneshwar
e. Specialised training in cold water fisheries- NRC on Cold Water Fisheries at Bhimtal
f. Fish Disease Management

ii) Exposure visits outside the state will be organized for the officers and they will be exposed to the following technologies, so that they get an opportunity to see and learn.

- Aquaculture farms of progressive farmers and institutions in Andhra Pradesh
- Ornamental fish farms in West Bengal and Kerala
- Private hatcheries run by entrepreneurs in Andhra Pradesh and Kerala
- Fish feed mills in the private sector in Andhra Pradesh
- Organised and well managed Fish markets in Andhra Pradesh and West Bengal
- Visit to scientific institutions connected to ornamental fisheries

2. Training and exposure visits for fish farmers

The fish farmers under the Mission will be provided training on the technologies to be adopted by them and they also will be exposed to technologies developed by the national institutes through exposure visits.

The farmers will be provided intensive training on the following topics:

a. Intensive Aquaculture in ponds and tanks- CIFA, Bhubaneshwar
b. Hatchery management – CIFRI, Barrackpore and such other institutions

The farmers will be taken for an All India exposure trip covering institutions such as NRC for Cold water fisheries at Bhimtal, CIFRI, Barrackpur, CIFA, Bhubaneswar, CIFT, Cochin and also aquaculture farms, feed mills and hatcheries in Andhra Pradesh, West Bengal and Kerala.

3. Training and exposure visit for Programme Managers and MSPs

The Programme Managers under the Mission will also be provided intensive short duration trainings, both within and outside the state on the technologies to be implemented through the Mission. Avery intensive induction training for the Programme Mangers will be organized so they can acquire the skill sets required by them to perform well in the field.

A training module will be developed with specific topics (theory and practicals/exercises) to cover the required skill sets and for enabling the trainees to acquire the skills expected of them.

There is also scope for employing skilled workforce in the fisheries sector for providing various services to the fish farmers, which is referred to as Multiple Service Providers (MSPs). They will be given intensive training by the Mission on selected technologies. The MSPs will be utilized for providing various fishery related services to the farmers. They will ensure timely access to seed (fingerlings), feed and disease management. They will visit the fish ponds under their jurisdiction, study the quality of water and assist the farmers in resolving any aberrant conditions relating to seed, feed and disease management. They will also assist the farmers in trial netting, harvesting and marketing of fish. It is proposed to engage MSPs on a contract basis. They will be appointed by the FFDA under the State Aquaculture Mission for a limited period of one year, renewable on annual basis and on a consolidated pay basis.

Required Skill sets for the MSPs and Programme Managers

A. MSPs

The MSPs should have passed Class 12. They will be given hands-on training and will attain the following skill sets:

a. Testing the soil and water of the fish ponds using water-soil analyzer kits, interpreting the results and providing guidance to the farmers.
b. Trial netting, to record the growth of fish and data capture.
c. Use of fishing equipments like happas, hand nets, aerators, etc.
d. Monitoring of the Pre-stocking management of ponds, including pond treatment, liming, manuring, stocking of fish seeds, etc.
e. Post stocking management including schedule of liming and manuring, raking, assessment of growth.
f. Diagnosis of fish diseases and treatment, harvesting techniques
g. Organising fishermen groups and developing fishery clusters
h. Collecting data and generating beneficiary level reports as per the needs of the Aquaculture Mission

The MSPs will be provided skill training by the officials of FFDA/ Fisheries Department for a month, based on a training module developed and approved by the Mission. The training module will be designed following 'DACUM' (Develop a Curriculum) approach. The DACUM process identifies about 8 to 10 job responsibilities and 20 to 25 competencies that outline what a successful worker in the job must be able to do. The competencies undergo a task analysis to determine the specific skills, knowledge and abilities the worker needs to perform each task. The information resulting from the task analysis is then incorporated into the learning outcomes, learning activities, instructional methods, tool kits and the assessment of learning. The required skills will be imparted through a combination of class room pedagogy, practical demonstrations and multi-media tools to enable the trainees to acquire the skills. Training methods will be individual-centred to make each person a competent one. Besides providing biological and technical contents, the training will also cover topics such as socio-economic aspects of fisheries, communication skill, issues concerning environmental sustainability, responsible fisheries, etc.

Indicative training module for the MSPs is given below.

1. Orientation and briefing of the components of the Aquaculture Mission
2. Socio-economic aspects of fisheries in the state
3. Roles and responsibilities of MSPs in the implementation
4. Selection of sites for pond, methodologies of pond construction
5. Pre-stocking management in ponds- pond treatment, liming, manuring, stocking of fish seeds
6. Testing the soil and water of the fish ponds using water-soil analyzer kits- interpretation of results and providing guidance
7. Post-stocking management in ponds- liming and manuring schedule, raking, trial netting and assessment of growth of fish
8. Use of fishing equipments like happas, hand nets, aerators, etc
9. Diagnosis of fish diseases and treatment methods
10. Organising fishermen groups and developing fishery clusters
11. Culture and breeding of carp, Composite fish culture and Integrated fish farming
12. Hatchery management
13. Feeding of fish
14. Harvesting techniques
15. Communication skills, and
16. Issues concerning environmental sustainability- Concept of responsible fisheries

B. Programme Managers

The Programme Managers have to acquire the following skill sets for performing their functions under the Mission.

- Technical skills – relating to the technologies in the fisheries sector
- Training skills- in organizing trainings, training methods, evaluation of training
- Communication skills- interpersonal communication and communication in groups
- Documentation & Reporting skills- report preparation, writing success stories, preparing news reports and press releases
- Facilitation skills- organising farmer groups, participating civil society organizations and other stakeholders, participatory planning and management
- Project Management skills- related to planning, implementation and reporting of projects

4. Capacity building of Fishery Co-operators

As part of strengthening of Fishery Co-operative Societies, the members of Fishery Co-operative Societies will be imparted training on Intensive Aquaculture, Ornamental Culture and Installation of FRP hatcheries at CIFA, Bhubaneswar. They will also be taken for All India exposure visits to expose them to the recent developments and technologies related to the fisheries sector.

5. Entrepreneurship development in the fisheries sector (Fishpreneurship development)

Besides the MSPs who will be provided skill trainings for wage employment in the fisheries sector, interested youth and progressive fish farmers will be provided skill training for starting enterprises in the fisheries sector. There are many practices which the fish farmers have to adopt, which require enhanced skills and human capacity. The Mission will address the entrepreneurial talents successfully to tap the potential of fisheries. An attempt will be made for the mass production of such talents through organizing Entrepreneurship development programmes (EDP). Entrepreneurs in the following two areas will be developed by the Mission.

i) Private economically viable fingerling producers- They will be imparted skills to produce and market fingerlings. They will be given training in the areas as below:
   a. Techniques of producing quality fish seeds (fingerlings)
   b. Operation and management of FRP hatcheries- fish breeding in field conditions, management and spawn production
   c. Management of nursery ponds, rearing ponds, stocking tanks, brood stock tanks, etc
   d. Practical tips on marketing, running small enterprise, availing credit and cash management.

ii) Private aquarium entrepreneurs –
   a. Culture and breeding of ornamental fish

b. Setting of aquarium tanks
c. Practical tips on running small enterprise, credit and cash management, marketing.

iii) Private feed producers –

a. Importance of quality feeds
b. Components of fish feed- Feed compounders
c. Formulation of good quality feeds
d. Pelleted feeds- Floating pellets and sinking pellets
e. Feeding method
f. Feed storage
g. Feed manufacturing equipments

6.2 Creating / Strengthening training infrastructure

The Mission will also strive for the organizational capacity building, which refers to the process of enabling the capability of an organization to perform the various tasks effectively. In the present case, the Department of Fisheries is not equipped to conduct trainings for the farmers in the absence of adequate training infrastructure. The Mission proposes to establish minimum training infrastructure in the district headquarters. It is proposed to establish seven training centres with adequate facilities for training. Availing the services of training institutions in Meghalaya like St. Anthony's College, CAU, Barapani, NEHR of ICAR, KVKs and Fisheries College, Tripura, Fisheries College, Jorhat and NERC of NIRD at Guwahati to support the trainings are envisaged to foster the capacity building at various levels and for diverse activities.

The Mission proposes to create a training team of three members (two technical specialists and one soft skills expert) at the headquarters to facilitate and execute custom-designed training programmes for the various stakeholders. A mobile training team will also be developed consisting of six members, whose services can be availed by the districts for organizing district level workshops and training programmes. The modalities of constituting the training team at the headquarters and mobile training team will be worked out, which may be through open advertisement or on deputation from highly recognized institutes.

Training of officers and farmers at CIFA, Bhubaneswar

The training team at the headquarters will also co-ordinate "Train on-line", a web based series of interactive lessons covering the various components of the Aquaculture Mission. The Mission will also develop a team of Master Trainers at the district level through Trainers training programme to cater to the needs of district level trainings.

At the end of first year of implementation, the effectiveness of training will be evaluated, reviewed and training need assessment will be conducted before designing training plan for the second and subsequent years.

6.3 Awards to fish farmers and incentives to departmental officers

To recognize the contribution of innovative fish farmers/communities/co-operatives societies etc. towards fishery development in the state and to motivate others to get involved in the programme, incentive in the form of awards will be included as one of the components under the Mission. The criteria of selection will be based on the contribution of the fish farmers in enhancing productivity, new initiatives, innovative management strategies, commitment towards work, additional income obtained from fish farming activities, etc.

The scheme will be widely advertised through the media and other means and eligible fish farmers will be encouraged to apply through their respective DEOs/EOs. The DEOs/EOs will make site inspection and recommend the names of fish farmers worthy to be considered for award in their area of jurisdiction to the CEO, FFDA. A five member judging committee will be appointed by the Government. The members will include retired senior officials of the Department, independent bodies like RRTC, members of the DF&MC, representative from the media and other Government functionaries. Eligibility criterion of a fish farmer to be considered for award will be only those who have been assisted under the Mission. The award ceremony will be celebrated in a big way.

Award will be both for the state and at the district level which will be in the form of either cash or kind equivalent to ₹ 50,000/- at the state level and ₹ 20,000/- at the district level. Other consolidation prizes will also be provided for both at the state and the district level. A fish farmer can be nominated either for state or district award. The awards shall be presented annually on the launching day of the Meghalaya State Aquaculture Mission.

Incentives towards the Departmental Officers/Programme Managers etc. involved in the implementation of the State Aquaculture Mission will also be considered. The parameters for selection will involve strategies, planning, performance in execution of the schemes right from the pre-implementation stage upto harvesting. The field level interventions and the opinion of the fish farmers also will be considered. The Selection Committee mentioned above will perform the task for both categories of awards.

Budgetary requirement for Mini Mission IV (Capacity Building and HRD)

(₹ Lakhs)

Sl. No.	Particulars	No.	Unit Cost	Total Amount
1.	Mass Mobilization Campaigns	28	3.00	84.00
2.	Orientation training programmes to potential fish farmers	75	3.00	225.00
3.	Orientation workshops to farmers/village communities desirous of creating fish sanctuaries	200	0.20	40.00
4.	Capacity building of stakeholders			
	a. Officials (training and exposure trips)	52	1.65	85.90
	b. Prospective Farmers (training and exposure trips)	30	2.47	74.00
	c. Orientation workshops for farmers under the Aquaculture Mission	195	0.60	117.00
	d. Training for Programme Managers	4	3.00	12.00
	e. Training & exposure visits for Multiple Service Providers @ 1 programme/year	5	1.00	5.00
	f. Capacity building of fishery co-operators including exposure trips	6	3.33	20.00
	g. EDP training	10	4.00	40.00
5.	Creating/strengthening training infrastructure			
	a. Construction of seven training halls (one in each district) with essential facilities, hostels, dormitories, pantry, etc.	7	100.00	700.00
	b. Purchase of training equipments	7	20.00	140.00
	c. Creating training team at HQ, mobile team for districts, Trainers' training, Train on line, etc. (L/S)			300.00
	d. Training for farmers (L/S)			150.00
	e. Training for Officers (L/S)			50.00
6.	Awards for Farmers and Officers			12.00
	Total			**2054.90**

Chapter VII

Mini Mission - V

Mass Media Campaign, Documentation and Outreach

Introduction

Mass media campaign refers to the use of all media technologies in a concerted manner, so the department/ agencies relay information to people at large. Mass media play a significant role in the mobilisation of public perceptions on a variety of important issues, both through the information that is dispensed, and the interpretations they place upon this information. Mass media helps in the process of transferring or transmitting a message to a large group of people.

7.1 Mass Mobilization Campaigns

Mass mobilization Campaign at Umsning (Ri-Bhoi District)

The Aquaculture Mission will mobilise the public perception through the medium of mass campaign in order successfully to publicise the goals, objectives and various technical and financial supporting programmes under the Mission and their likely impact on socio-economic welfare of the rural people, the target section of the Mission. In order to create public awareness, the mass media campaign would be used intensively by the Aquaculture Mission to sensitise people toward the fisheries sector. This would cover scientific workshops and seminars, public meetings, press releases on mission's objectives published in Khasi, Garo and English news papers, success stories as also documentary films telecast by electronic media, etc., which are detailed below:

1. Scientific Workshops and Seminars

Workshops and Seminars are considered to be an important tool in helping the communication of technical components of the Mission. Organization of several such workshops would be undertaken, where experts from within the institutions of State and from the institutions of repute, namely, CIFA, NFDB, ICAR, CIFRI, CIFT, etc. would be invited to participate in deliberations and contribute. This in turn would enrich the knowledge of different stakeholders like the officials of the Department, Fish Farmers, and Functionaries of the Aquaculture Mission. NGOs, SHGs, Entrepreneurs, Fishery Co-operative Societies, etc.

would also be invited to share their views on the various issues concerning the fishery development in the state. Such workshops and seminars would be organised periodically during the implementation period of the Mission.

Likewise, periodical review workshops with the experts from the various fields of fisheries, consisting of state officials and other functionaries of Aquaculture Mission would also be organised periodically to facilitate the up-gradation and dissemination of the fish production technologies, and to review the progress of the planned programmes. This would further help in the dissemination of information relating to fish production and harvesting technologies.

2. Interaction Meets

Interaction meets between the officials of the fisheries department and fish farmers is one of the ways of mobilising the public perception would be organised under Aquaculture Mission periodically at various locations in the state to provide an opportunity to the people to express their views on the various components of the Mission. The interaction meets would also identify the constraints in the implementation of the various planned programmes and measures thereof. The interaction meet would also emphasise the importance of protection and conservation of indigenous species of fish, and their commercial value and other emerging opportunities in the fishery sector. Such meets would help in bringing fish farmers and department officials together in making a significant impact on the perceptions of the people. These would be organised at block level by the functionaries of the Aquaculture Mission. The Bank authorities will also attend these interaction meets to iron out any issues relating to the credit linkage.

3. Public Meetings

Public meetings would also be organised to make the people aware about the ill-effects of indiscriminate killing of fish by dynamiting, poisoning and so on. Fish killing by dynamiting and poisoning are prevalent in most of the districts, but destruction of aquatic life due to unscientific mining is prevailing more commonly especially in the districts like Jaintia and Garo Hills, where mining activities are undertaken at large and river water pollution is very high. Such meetings deliberate in detail about the problems and come out with strategies to motivate the people at large for their active involvement in the conservation of biodiversity and ecosystem of the state. Such public meetings would be organised by the functionaries of the Aquaculture Mission in the cluster of villages, especially those near the rivers and/or streams. The specialists of riverine fisheries, local people, Headmen, Nokmas, Sirdars and communities, NGOs, etc. will attend these meetings.

Mass Awareness

a. In order to popularise various kinds of fish species, fish products, prophylactic measures, disease management, and provide a forum for transmission of new ideas relating to

fishery sector, organisation of Fish Festivals/ Melas/ Exhibitions is another important tool for mass mobilisation that would be used by the Mission to promote fishery development in the state.

b. Preservation and conservation of the local fish fauna are immensely important. Mass mobilisation campaign would be an integral part of the Missions' activities to motivate and convince the local people, Headmen, Nokmas, Sirdars and communities, especially those living nearby the rivers or streams about the importance of preservation and conservation of local fish fauna and the need to support such activities. There would also be orientation workshops for the farmers, involved in this activity.

Awareness Campaign at Williamnagar

7.2 Publicity through Mass Media Campaigns

Mass Communication is classified into two on the basis of media- i). Print media and ii). Electronic (Audio/ Visual) media. Print media includes newspapers, magazines and journals. Electronic media includes Radio, Television and the Web. Aquaculture Mission intends to use both the media intensively for mass mobilisation of people about the state Aquaculture Mission, its goals and various activities.

1. Advertisements in News Papers

The goals, objectives and various technical programmes under the Aquaculture Mission, and their likely impact on socio-economic welfare of the rural people at large would be advertised quarterly in a few leading Local and English News papers as one of the important activities of the Aquaculture Mission. This would create the requisite knowledge base in the society about the various programmes of the Mission and their likely impact on the livelihoods of the people at large.

2. Press conferences

Periodical press conferences on the progress made under the various activities/ programmes of the Aquaculture Mission would be organised quarterly. Information if any relating to mid-course adjustment of the activities for achieving the goals of the Mission would also be highlighted during the press conferences. The local news channels of different electronic media would also telecast the progress and achievements of the Mission in order to motivate and mobilise the participation of the people.

3. Press Conducted Tour

Press Conducted Tours (PCT) with personnel of electronic and print media would be organised to visit the villages, where mission's activities are currently underway. This will help the press to analyse the public perception about the activities. Such PCTs would also facilitate in the assessment of the Mission's impact on the people benefited under the Aquaculture Mission.

4. Radio Broadcasting

Radio broadcasting is a one-way wireless transmission intended to reach people at large. It can carry out essential information to much wider audience, is more viable as it is a much cheaper medium, with low production cost and requires minimum resources. Audio broadcasting also can be done via cable radio, local wire television networks, F.M. radio, and internet radio via streaming media on the Internet. Aquaculture Mission intends to use this media intensively to reach the people of remote rural areas through the following:

a. Frequent broadcasts through local Radio on the goals of the MSAM and various activities under it, including modern methods of fish pond construction, seed & feed management, culturing of specific species of fish and modern fish markets.

b. Feature stories on Mission's programmes such as area expansion, conservation of indigenous species of fish, etc. would also be broad cast through local Radio stations in different local languages.

5. Television Telecast

In a country like ours, with a huge illiterate population, television is an ideal instrument for transmitting social messages. Television also has a very wide range, output and reach. Realising its importance the Mission plans to use this medium on a large scale. The following components are likely be telecast frequently by various local channels of television media.

a. Educational documentary films showing various components of mission to school children.

b. Periodical telecasting of the documentary films relating to the conservation and preservation of indigenous species of fish to mobilise the people's opinion on the commercial value of such species.

c. Video films on Hatchery Management, modern methods of fish pond construction, seed & feed management, culturing of specific species of fish and modern fish markets.

6. New Media Campaigns

Development and widespread use of computers and information technology have resulted in the emergence of what is called 'new media'. It includes computers, information technology, communication networks and digital media. This has led to another process in mass

communication called ‘convergence’. Convergence means coming together of many forms of media and other formats like printed text, photographs, films, recorded music or radio, television etc. Though it is hard to separate old media from new media the World Wide Web or internet has changed the way in which we communicate. The Aquaculture Mission intends to use this technology for its mass media campaign and would be managed and coordinated by the professionals.

7. Website Development

Website is a collection of related web pages containing images, videos and/ or other digital assets. Creation of a website for better information dissemination therefore, is another major activity under the Mission. The FFDA will create and develop website by using the services of skilled web developers. The contents and other important information would be provided by the experts and other personnel, who are closely associated with the Mission. The website would also find appropriate place for video-clips and images, and success stories. The Website development and regular updating would also be done by professionals on contractual basis.

7.3 Outreach Programme for Mass mobilisation

The outreach programmes for mass mobilisation include competitions for school children, fish Melas/ Exhibitions, Poster campaigns, Onstage/ Live campaign (dramas, street plays, songs and slogans).

1. Competitions for School Children

Organising competitions for the school children on various themes of the Mission, particularly conservation of Mahseer/riverine fish sanctuaries is an important means for creating awareness among the school children who would be faster propagators of information on indigenous species of fish and the importance of their conservation. The Mission intends to organize competitions for school children on various aspects of eco-friendly fish culture in general and conservation/ preservation of indigenous species of fish in particular at block level in the different districts of the state annually. This would facilitate mass awareness among the school children on the importance of indigenous species of fish and their conservation for protecting the environmental degradation.

2. Fish Melas/Exhibitions

Fish Melas and exhibitions are other important tools for mass mobilisation, where various live specimens relating to fish and fish products are scientifically displayed in specified places. Mission plans to organise such Fish Melas and Exhibitions with the display of various components of fish production technologies including modern ways of fish pond construction, maintenance of fish ponds and fish feed, fish harvesting, etc. Various kinds of cooked materials and processed products of fish would also be displayed at Melas/ Exhibition

site to be organised at district level annually. Fish farmers of different villages of the districts, government officials, private traders, feed and implement manufacturers/ traders, NGOs associated with fisheries development, fishery cooperatives, etc. would be invited to visit and participate in the events. Technical sessions by the fish farmers and officials of the departments, NGOs, and equipment manufacturers/traders of fish would also be organized at the Melas' site, where fish farmers would raise various issues, concerning to fisheries development which technical personnel of the departments and personnel of other invited organisations would respond/clarify. This would help in the fast dissemination of information on modern technology for fisheries development in the state.

3. Poster Campaign

Display of posters is another technique that helps in mobilising the people's interest and it will be used extensively for the promotion of various activities planned under the Mission. Such Posters would carefully be designed taking into account the targeted audience and displayed at various strategic places in the rural areas to attract the attention of people toward the Mission and its goals. The posters would be appropriately designed to cover the goals and crucial activities, inputs, technological and financial support intended to be provided under the Mission.

4. Onstage/ Live Campaign

Songs, dramas and street plays are forms of traditional media and are a part of our country's rich heritage. They belong to the people and are strongly rooted in culture. Songs and dances can inform, educate and entertain people. Though the advent of faster forms of media has affected traditional media, its significance still continues in many parts of county in general and Meghalaya state in particular. The Mission intends to make use of this traditional media as a mass mobilisation tool by engaging the local artists to perform the plays, song and dance sequences etc. for the public.

a. Songs, Dramas and Street Play

Performers/ communicators and the audience in song, drama and street play are known to each other unlike in radio or television. The environment in which the performances take place is natural, known and friendly. The messages are also simple, the content known and the language and idioms are familiar. Unlike other modern media, people never get tired of them. There are several forms of traditional media in our country. They are known by different names in different regions. Some common examples of traditional media are storytelling, folk songs, street theatre and puppetry. The traditional media are generally spontaneous and/ or made on the spot. The Aquaculture Mission plans to use this traditional form of media by organising such events at each and every block/ district levels. This would help to bring significant impact on the perceptions of rural people

toward the adoption of modern methods of fish culture and conservation of indigenous fish species at large.

b. Slogans

Slogan is a part of mass mobilisation campaign usually presented itself in the written text. Like the advertising for mass opinion mobilisation, slogan helps to invite, influence, appeal, show, negate and even accept the idea that what is presented is the best for those who accept it. Slogan is structurally an effective and efficient tool in term of delivering certain messages of the sender to the people at large. Slogan is presented in various persuasive and active mode and often in obliging ways to create a situation that everybody has to continuously listen, see, and feel the messages of the slogan. The Aquaculture Mission would use this tool to induce the aspirations among the people at large towards various programmes under the Mission. Slogans with catchy messages, concerning crucial components of mission's programmes would be prepared and used at various strategic locations in the state.

7.4 Documentation of Mission's Activities

Documentation of the proceedings of workshops/ seminars, goals and activities, technical components of the programmes, success stories of the Mission, media coverage, content notes, convergence notes and annual reports are the other important components of the mass mobilisation campaign.

1. Pamphlets and Booklets

Pamphlets and booklets with detailed outlines (various schemes and training, mode of applications and financial assistance, etc.) of the Mission would be printed in Khasi, Garo and English languages and distributed among the rural people of the state. Leaflets with brief descriptions of the Mission, its aim and objectives would also be used as a tool for mass mobilisation campaign towards the fishery development programmes.

2. Technical Manual

Mission Document and Technical Manuals would be prepared taking all scientific and feasibility components into account and would be put in public domain. The Technical Manuals would highlight the following major aspects, concerning the implementation of Mission's programmes.

a) Selection of sites for pond construction
b) Methodology on construction of pond
c) Pre stocking management
d) Post stocking management
e) Monthly management of the Ponds

f) Common fish diseases and their treatment
g) Feed management
h) Post-harvest management
i) Conservation and preservation of indigenous species
j) Ornamental fisheries, and
k) Other subject of importance to the people

3. Success Stories

Development of success stories is one of the important tools, which can demonstrate that reaching the target and achieving the goals is not as far as it may seem and it can be as easy as setting the goals itself. One needs to read those stories and see how those people achieved their goals, although the goals may be different from each other. Keeping these in view, the Aquaculture Mission has plans to document unique achievements in fish culture/ conservation made by individuals and/ or groups. This would help inspire other fish farmers of the state.

4. Documentation of Media Coverage

Press and Media coverage provide a lot of valuable feedback both from the Press and its registered users. The Aquaculture Mission therefore, intends to document the clippings of media coverage in an appropriate manner which would help in providing feedback and in monitoring and evaluating the coverage in the media and its effectiveness.

5. Annual Reports

Annual reports give stakeholders and other interested people information about the Mission's activities and financial performance. One of the major thrusts of the mission's documentation programme is reporting of its annual progress in the form of Annual Reports at the end of each year of its implementation and the same will be distributed among the various stakeholders and the media for assessing the progress of the Mission. While preparing the reports, the following key points would be taken into consideration:

- Progress related to coverage/ expansion of water area/ farm households under Mission,
- Achievement in respect of implementation of planned activities under the Mission and the realization, thereafter,
- Manpower engaged in facilitating the implementation of Mission's programmes
- Fund allocation and utilisation programme/Head wise.

6. Newsletter

A newsletter is a regularly distributed publication generally centered around one main theme that is of interest to its reader. The Aquaculture Mission plans to publish a quarterly "Newsletter" on different aspects of the Mission concerning the recent and crucial events, and

achievements taken place during the reporting quarter. This would help to create mass awareness among various stakeholders including different officials about the events and achievements, the Aquaculture Mission organizes/ realizes during the period.

The budget requirement for various components of Mass Mobilisation Campaign, Documentation and outreach Programmes are detailed in the Annexure.

Table 7.1: Budget Details for Mass Mobilization Campaign, Documentation and Outreach Programmes

S.N.	Particulars	Numbers of Participants/documents/ reports/displays	Anticipated cost per event/ unit of article (₹ Lakhs)	Total costs for five years(₹ Lakhs)	
				First year of implementation	Remaining 4 years of implementation
1.	**Workshops and public meetings**				
i.	Scientific workshops/ seminars	Annually with 200 participants	2.50	10.00	40.00
ii.	Periodical review workshops	Quarterly with 100 participants	3.00	12.00	48.00
iii.	Interactive meets	Quarterly with 100 participants	3.00	12.00	48.00
iv.	Mass awareness campaigns	One cycle every year in all the districts	20.00	20.00	80.00
2.	**Mass Media Campaigns**				
i.	Advertisements in News Papers	Quarterly in local leading News Papers	4.00	16.00	64.00
ii.	Press conferences	Quarterly in Shillong	0.25	1.00	4.00
iii.	Press conducted tours	Annually	2.50	2.50	10.00
iv.	Radio Broadcasting	Quarterly through local station	0.20	0.80	3.20
v.	Television telecasting	Quarterly 3-4 video clips through local channels	0.75	3.00	12.00
vi.	Convergence- new medium campaign	Annually through contracted professionals	10.00	20.00	8.00
vii.	Web site development and maintenance	Annually through contracted professionals	10.00	10.00	10.00
viii.	Engagement of Professional personnel for mass media campaigns	Three professionals and one Assistant on contractual basis	6.00	6.00	24.00

S.N.	Particulars	Numbers of Participants/documents/ reports/displays	Anticipated cost per event/ unit of article (₹ Lakhs)	Total costs for five years(₹ Lakhs)	
				First year of implementation	Remaining 4 years of implementation
3.	**Outreach Programmes**				
i.	School children competitions	Annually each at 39 blocks	0.80	0.80	3.20
ii.	Fish Melas/ Exhibitions	Annually each in 7 districts @ ₹ 3.00 lakh	21.00	21.00	84.00
iii.	Poster campaigns	Annually in 600 villages	30.00	30.00	120.00
iv.	Song/ drama/ street plays	Annually in 39 blocks @ ₹ 50,000/- each	19.50	19.50	78.00
v.	Slogans	Annually at 4-5 events of different places	0.25	0.25	1.00
4.	**Documentation**				
i.	Pamphlets and booklets	Annually, 25,000 pamphlets & booklets in 3 languages	5.00	5.00	20.00
ii.	Technical manuals	Annually, 7,000 manuals in 3 languages	3.50	3.50	14.00
iii.	Success stories	Annually, 3-4 stories with 1000 copies	5.00	5.00	20.00
iv.	Media coverage (advertisement)	Regularly on annual basis	5.00	5.00	20.00
v.	Annual reports	Annually, 1000 copies	1.00	1.00	4.00
vi.	Newsletters	Quarterly, 1000 copies	2.00	2.00	8.00
vii.	Other documents and miscellaneous cost (L/S)			20.00	80.00
	Total			**226.35**	**803.40**

Grand total budget of mass mobilization campaign for entire period (5 years) of Project would be **1029.75 lakhs**

Chapter VIII

Mini Mission – VI

Emerging opportunities in the Fisheries Sector

As indicated elsewhere in the document, there is an exclusive visionary component envisaged under the Mission for tapping the emerging opportunities in the fisheries sector and addressing them with scientific backstopping for further exploration. The potential for breeding and rearing of ornamental fish, trout farming, freshwater prawn culture, etc has to fully exploited. Under the Mission, appropriate sites and structures of water bodies will be identified for promoting aqua tourism.

8.1 Ornamental/aquarium fisheries

An Angel Fish

Ornamental fish are the world's most popular pets and fish keeping in Aquarium is one the most popular hobbies. Aquarium can be found at the airports, hotels, business houses, departmental stores, hospitals and several other places. In aquaculture sector, the ornamental fish breeding and trade provides excellent opportunities as a non-food fishery activity for employment and income generation. It is totally environment-friendly, socially acceptable and involves low investment with short gestation period. It could be adapted as a small-scale backyard enterprise either full-time or part-time and ensures high profit.

People of Meghalaya are known to be nature lovers and with the recent advances in filtration, accessibility of pelleted feeds, automatic heaters, colourful lighting, artificial aquatic plants, etc more and more people are taking up fish keeping as a hobby, thereby resulting in high demand of ornamental fish, Glass Aquarium, etc.

To meet the demand of the aquarists, the business is carried out by importing ornamental fish, Glass Aquarium, etc from other states of the country and sold through aquaria shops or hobby centres available in some pockets of the state. Some youth have started manufacturing glass aquaria, but commercial breeders are yet to be come in.

In a bid to create employment opportunities for the local unemployed youth, it is felt that ornamental fisheries should be introduced in the State Aquaculture Mission.

1. Breeders & Rearers:

This category comprises of entrepreneurs who culture, breed and rear various ornamental fish, both indigenous and exotic.

On successful breeding, the fry are reared for 2 – 3 months and till they grow to a marketable size. They will then be sold to the retail shop or hobby centres.

2. Hobby/Retail Centres-cum-Aquarium manufacturing/Fabrication unit:

They are the link between the breeders and those who buy these fish as hobby. Owner of hobby centres buy the fish from the breeders/rearers and in turn sell them to the hobbyist and other people who keep aquarium. Besides fish, these hobby centers also provide the hobbyist with readymade dry and live food, air pumps, pebbles, medicines, etc. They also give technical advice on various aspects of aquarium maintenance, disease, etc to the aquarists. They play an important role in the development of the aquarium trade.

Aquarium manufacturing is one of the important components of the trade, through which employment opportunities can be generated. Some youth in a limited scale can start manufacturing of aquarium and supply them through the hobby centres or directly to the hobbyist. Under the Mission, hobby centres-cum-aquarium manufacturing/ fabrication unit will be combined into one component and financial assistance will be extended to the entrepreneurs to improve this potential area.

Apart from financial assistance, the breeders/rearers hobby/retail centres-cum-Aquarium manufacturers will also be sent for training at C.I.F.A, Bhubaneswar. Retailers/hobby centres are the people who have direct contact with the consumers. They will be trained about the care and maintenance of aquarium, care of diseased fish, quarantine, etc so that they can help the consumers in need. Most of the shopkeepers do not have the basic knowledge and thus cannot help the consumer, who in turn lose their interest in this hobby or prized fish die due to lack of proper technical knowledge. Those who are engaged in breeding will be assisted by the Department in procuring supply of good quality brooder having desired pedigree. They will be ensured that various indigenous and exotic fish which have export values will be supplied and supported with all technical know-how required in this area.

Table 8.1: Budget details for ornamental fisheries

(₹ Lakhs)

Sl. No.	Items/ Particulars	Units/ Nos.	Total Project Cost @ 1.00 lakh per unit	60% subsidy	25% Bank Loan	15% beneficiary contribution
1.	Culture & breeding of ornamental fishes	25	25.00	15.00	6.25	3.75
2.	Setting up of aquarium manufacturing units-cum-hobby centres	10	10.00	6.00	2.50	1.50
TOTAL			**35.00**	**21.00**	**8.75**	**5.25**

Table 8.2: Year-wise distribution of ornamental fisheries and setting up of aquarium manufacturing units-cum-hobby centres

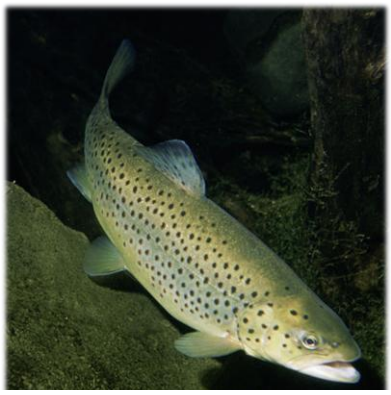
Sl. No.	Items/Particulars	2012-13	2013-14	2014-15	2014-15	2014-15
1.	Culture & breeding of ornamental fishes	5	5	5	5	5
2.	Setting up of aquarium manufacturing units-cum-hobby centres	2	2	2	2	2
TOTAL		**7**	**7**	**7**	**7**	**7**

3. Ornamental Fishery Park:

The Meghalaya Government will also negotiate with MPEDA, to establish an ornamental fish park in the state of Meghalaya by making available the required land and other facilities.

8.2 Trout Farming

The agro-climatic conditions of Meghalaya are very congenial for cold water aquaculture. It is reported that trout can be cultivated at lower elevations even up to 1000 MSL provided the optimum water quality is ensured. Water quality is the main criterion for trout farming and turbid water is to be avoided.



Brown Trout

The important operations related to trout farming are:

a. Selection of site: The site should be such that perennial source of water must be available.

b. Construction of ponds: Rectangular tanks are preferred. Cemented ponds can be used.

c. Water supply: The water supply in the farm/pond should be regulated through a filter bed or sedimentation tank.

d. Physico-chemical parameters required for trout farming
   i. Temperature- range of 10-18 °C is ideal.
   ii. Dissolved oxygen- 5.8 to 9.5 mg/L
   iii. pH- Neutral or slightly alkaline pH is best. The ideal range is 5.5 to 9.0.
   iv. Turbidity-There should not be any turbid condition and the water should be crystal clear.

e. Stocking density- Fry fingerlings (5 to 50 g) is stocked at the rate of 20 kg fish/cm of water surface area.

f. Supply of feed- Feed should be supplied at regular intervals

g. Table size fish- Fish after gaining weight of 250 gm is advisable to be harvested.

h. Hygiene- Cleanliness of the water surface is important for trout farming.

In Meghalaya it is found that there is an increasing interest in trout fishing and some visitors have been enquiring about the places where they could go for trout fishing. Trout farming in Meghalaya even though is a challenging task will be one of the components covered under the Aquaculture Mission which will be taken up on experimental basis. The project will be a joint venture between the Department of Fisheries, Meghalaya and Directorate of Coldwater Fisheries, Bhimtal, Uttarakhand. All technical expertise right from the assessment on the feasibility of the farms, survey, breeding, training, etc. will be provided by the experts from Bhimtal. It is targeted that 9 projects will be covered at a total cost of ₹ 14.85 lakhs in which financial assistance of 60% subsidy, 25% bank loan and 15% own contribution will be provided to the interested fish farmers having the requisite criteria for establishing such farms. Cost and assistance is as per table 8.3.

Table 8.3: Cost and assistance components of individual pond of 0.1 ha for Trout Farming

Item	Specification	Value (₹)
Area of the Pond (m^2)	1000	-
Depth of the Pond (m)	1.5	-
Volume of the Pond (m^3)	1500	-
Earth work per worker per day (m^3)	2.5	-
Labour days for excavation	600	-
Wage rate per day (₹)	120	-
Total wage cost for excavation (₹)	600 x 120	72000
A.C. pipes	4 nos.	1500
A. Capital Expenditure		**73500**
Lime 100 kg @ ₹ 12/- per kg	100 x 12	1200
Raw caw dung 1000 kg @ ₹ 1/- per kg	1000 x 1	1000
Ammonium super phosphate 20 kg @ ₹ 8/- per kg	20 x 8	160
Urea 20 kg @ ₹ 8/- per kg	20 x 8	160
20,000 fry @ ₹ 2/- each	20000 x 2	40000
Feed	L/S	15000
Health Care	L/S	2000
Fishing equipment including aerators, etc.	L/S	30576
Labour 12 man-days @ ₹ 117/- per day	12 x 117	1404
B. Input Cost		**91500**
D. Total Cost (A+B)		**165000**
Assistance		**99000**
Bank Loan		**41250**
Own Contribution		**24750**

Table 8.4: Distribution of individual pond for Trout Farming

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
East Khasi Hills	-	1	1	1	-	3
West Khasi Hills	-	1	1	1	-	3
Jaintia Hills	-	1	1	1	-	3
Total	**-**	**3**	**3**	**3**	**-**	**9**

8.3 Introduction of freshwater prawn culture

Freshwater Prawn

Macrobrachium rosenbergii also known as *'Scampi'* is the largest of the Family Palaemonidae. It is found in most inland freshwater areas including lakes, rivers, swamps, irrigation ditches, canals and ponds as well as in estuarine areas. The species is suitable for cultivation in tropical and subtropical climates. In the natural environment, lower reaches of rivers, tidal inlets, where water is directly or indirectly connected with sea are their preferred habitat, specially during spawning.

Scampi is very tasty and its protein content is of a very high quality. It has a very fast growth rate in comparison to other freshwater prawn and suitable for culture in both tropical and sub-tropical regions. Culture of scampi can be monoculture or mixed culture with carps. Being hardy in nature, it has better resistance against diseases compared to marine prawn. In view of its high market value, scampi culture is more preferred than culture of other fishes. Successful scampi culture mainly depends on careful selection of suitable sites, wherein, climatic conditions, soil type, availability of abundant and good quality water, approach road, etc. are some of the important criteria for its culture. The types of feed used in freshwater prawn farming vary widely and include individual animal or vegetable raw materials and feed mixtures prepared at the pond bank; both of these are generally referred to as 'farm-made feeds'. Commercial feeds designed for freshwater prawns are available such as fish meal or soybean meal. Compounded chicken and pig feeds, either unmodified, or re-extruded through a mincer with trash fish or prawn meal, have also been used in freshwater prawn farming. The duration of culture varies from 6 to 12 months depending on the type of culture practice. In Scampi culture, the harvesting is generally conducted periodically which will provide scope for faster growth to the reduced population. The average growth of prawn may range from 50 to 200 g depending on the duration, density, water quality, feeding etc. The survival rate may range from 70 to 80 percent depending on the management practices.

Under the Mission, polyculture of prawn with carps (replacing bottom feeders with fresh water prawns) will be taken up on experimental basis in private sectors ranging from 0.1 ha (min.) to 0.3 ha (max.) who are interested in taking up the programme. 20 (twenty) projects are targeted to be taken up within 5 years (2012 – 2017) at a total cost of ₹ 34.40 lakhs. Assistance will be provided at 60% subsidy, 25% bank loan and 15% own contribution as per table indicated below.

Table 8.5: Cost and assistance components of individual freshwater prawn culture of 0.1 ha

Item	Specification	Value (₹)
Area of the Pond (m^2)	1000	-
Depth of the Pond (m)	1.5	-
Volume of the Pond (m^3)	1500	-
Earth work per worker per day (m^3)	2.5	-
Labour days for excavation	600	-
Wage rate per day (₹)	120	-
Total wage cost for excavation (₹)	600 x 120	72000
A.C. pipes	4 nos.	1500
A. Capital Expenditure		**73500**
Lime 40 kg ha @ ₹ 12/- per kg	40 x 12	480
Raw caw dung 1000 kg @ ₹ 1/- per kg	1000 x 1	1000
Ammonium super phosphate 20 kg @ ₹ 8/- per kg	20 x 8	160
Urea 20 kg @ ₹ 8/- per kg	20 x 8	160
Prawn Seed (PL-5) 2,000 nos. @ ₹ 20/- each	2000 x 20	40000
Feed 370 kg @ ₹ 60/- per kg	370 x 60	22200
Health Care	L/S	2000
Fishing equipment including aerators, etc.	L/S	31096
Labour 12 man-days @ ₹ 117/- per day	12 x 117	1404
B. Input Cost		**98500**
D. Total Cost (A+B)		**172000**
Assistance		**103200**
Bank Loan		**43000**
Own Contribution		**25800**

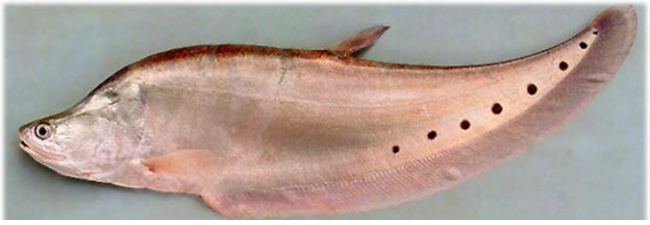
Table 8.6: Distribution of Individual freshwater prawn area district-wise

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
Ri-Bhoi	-	2	1	1	-	4
West Garo Hills	-	2	2	2	1	7
East Garo Hills	-	1	1	1	1	4
South Garo Hills	-	2	1	1	1	5
Total	**-**	**7**	**5**	**5**	**3**	**20**

8.4 Introduction of new Table species

As the position stands today, the traditional aquaculture in the state mainly relates to the culture and production of carps as the main crop. Diversification of the culture system with the non-conventional species (Freshwater prawn, *Tilapia mossambica, Notopterus chitala, Labeo gonius, Puntius sarana* and cat fishes) will be adopted. Diversification of fish species, activity and production will be an important contribution to ensure the sustainable development of aquaculture. It is also a tool for expansion of the sector responding to an ever changing nature of consumer demand. The State Aquaculture Mission will explore on experimental basis the following programmes for introduction of new table species.

1. Polyculture of Chital with Tilapia



Chital

Chital is a common predatory fish. Hence, polyculture of Chital with Tilapia will be more profitable than monoculture of Chital. Other advantage in this culture is that Tilapia control the unwanted aquatic weeds, thereby minimizing the cost of labor for management. Tilapia serves as food for Chital and hence cost of feeding of Chital will be minimized. Chital fetches a very high price of ₹ 400 – 600/kg and will be more profitable to the fish farmers as both the species have a fast growth rate of 1kg/year as shown in the Economic charts. The scheme will be introduced on an experimental basis in all the 7 (seven) districts of the state covering a water area of 40 hectares with an approximate number of 400 projects of 0.1 ha each. A total expenditure of ₹ 444 lakhs will be involved in taking up this programme with a subsidy of 60%, bank loan 25% and own contribution 15%. Cost and assistance is as per table 8.7.

Tilapia

Table 8.7: Cost and assistance components of individual pond of 0.1 ha for polyculture of chital with tilapia

Item	Specification	Value (₹)
Area of the Pond (m^2)	1000	-
Depth of the Pond (m)	1.5	-
Volume of the Pond (m^3)	1500	-
Earth work per worker per day (m^3)	2.5	-
Labour days for excavation	600	-
Wage rate per day (₹)	120	-
Total wage cost for excavation (₹)	600 x 120	72000
A.C. pipes	4 nos.	1500
A. Capital Expenditure		**73500**
Lime 100 kg @ ₹ 12/- per kg	100 x 12	1200
Raw caw dung 1000 kg @ ₹ 1/- per kg	1000 x 1	1000
Ammonium super phosphate 20 kg @ ₹ 8/- per kg	20 x 8	160
Urea 20 kg @ ₹ 8/- per kg	20 x 8	160
Tilapia fish seeds 1,600 nos. @ ₹ 1/- each (50-70mm size)	1600 x 1	1600
Chital fish seeds 400 nos. @ ₹ 50/- each (100-150mm size)	400 x 50	20000
Feed		
a. Fish meal 100 kg @ ₹ 25/- per kg	100 x 25	2500
b. Rice bran 50 kg @ ₹ 15/- per kg	50 x 15	750
c. Oil cake 50 kg @ ₹ 20/- per kg	50 x 20	1000
Health Care	L/S	2000
Fishing equipment	L/S	5726
Labour 12 man-days @ ₹ 117/- per day	12 x 117	1404
B. Input Cost		**37500**
D. Total Cost (A+B)		**111000**
Assistance		**66600**
Bank Loan		**27750**
Own Contribution		**16650**

Table 8.8: Distribution of individual pond of 0.1 ha for polyculture of chital with tilapia (district-wise)

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
East Khasi Hills	1	1	0.5	0.5	0.5	3.5
Ri-Bhoi	2	1	1	1	1	6
West Khasi Hills	1	0.5	0.5	0.5	0.5	3
Jaintia Hills	1	0.5	0.5	0.5	0.5	3
West Garo Hills	4	2	2	2	2	12
East Garo Hills	2	1	1	1	0.5	5.5
South Garo Hills	3	1	1	1	1	7
Total	**14**	**7**	**6.5**	**6.5**	**6**	**40**

2. Polyculture of *Puntius sarana* with Carp

Puntius sarana

Puntius sarana is a tropical freshwater fish belonging to the *Puntius* genus of minnow family. This species is commonly known as 'olive barb' which can be used both as food fish and ornamental fish. This is very widely distributed in all the northern and north-eastern rivers of India. It attains a length of 31 cm in one year period. The species is omnivorous and feeds on aquatic insects, unwanted fish and algae. The digestibility and biological value of flesh of this species is very high. In one year it can grow up to 400-500 gm and fetches around ₹ 100-150/- per kg. This species is considered for the "biological control" in aqua cultural practices, since it can be used for eradication of aquatic weeds (*Lemna* species) from the water bodies like ponds and tanks. Since the species possesses culture potential, its introduction into the carp polyculture system would not only help in diversification of culture practices, but also can serve for its conservation. The species is compatible with both mrigal and rohu. Polyculture of *P. sarana* with four other major carps viz. *Labeo rohita*(rohu), *Catla catla*(catla), *Cirrhinus mrigala*(mrigal), *Cyprinus carpio*(common carp) will be introduced on experimental basis in all the 7 (seven) districts of the state covering a water area of 20 hectares with approximately 200 projects of 0.1 ha each. Assistance will be provided to the interested fish farmers at 60% subsidy, 25% bank loan and 15% own contribution, thereby involving the total investment cost of ₹ 184 lakhs. Cost and assistance is as per table 8.9.

Table 8.9: Cost and assistance components of individual pond of 0.1 ha for polyculture of *Puntius sarana* with carps

Item	Specification	Value (₹)
Area of the Pond (m^2)	1000	-
Depth of the Pond (m)	1.5	-
Volume of the Pond (m^3)	1500	-
Earth work per worker per day (m^3)	2.5	-
Labour days for excavation	600	-
Wage rate per day (₹)	120	-
Total wage cost for excavation (₹)	600 x 120	72000
A.C. pipes	4 nos.	1500
A. Capital Expenditure		**73500**
Lime 100 kg @ ₹ 12/- per kg	100 x 12	1200
Raw caw dung 1000 kg @ ₹ 1/- per kg	1000 x 1	1000
Ammonium super phosphate 20 kg @ ₹ 8/- per kg	20 x 8	160
Urea 20 kg @ ₹ 8/- per kg	20 x 8	160
IMC & common carp seeds 1,400 nos. @ ₹ 2/- each (100-150mm size)	1400 x 2	2800
Puntius sarana seeds 600 nos. @ ₹ 2/- each (50-70mm size)	600 x 2	1200
Feed:		
a. Fish meal 50 kg @ ₹ 25/- per kg	50 x 25	1250
b. Rice bran 50 kg @ ₹ 15/- per kg	50 x 15	750
c. Oil cake 50 kg @ ₹ 20/- per kg	50 x 20	1000
Health Care	L/S	2000
Fishing equipment	L/S	5576
Labour 12 man-days @ ₹ 117/- per day	12 x 117	1404
B. Input Cost		**18500**
C. Total Cost (A+B)		**92000**
Assistance		**55200**
Bank Loan		**23000**
Own Contribution		**13800**

Table 8.10: Distribution of individual pond of 0.1 ha for polyculture of *Puntius sarana* with carps (district-wise)

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
East Khasi Hills	0.5	0.5	0.4	0.3	0.3	**2.00**
Ri-Bhoi	1	0.5	0.5	0.5	0.5	**3.00**
West Khasi Hills	0.5	0.3	0.3	0.2	0.2	**1.50**
Jaintia Hills	0.5	0.3	0.3	0.2	0.2	**1.50**
West Garo Hills	2	1	1	1	1	**6.00**
East Garo Hills	1	0.5	0.5	0.5	0.5	**3.00**
South Garo Hills	1	0.5	0.5	0.5	0.5	**3.00**
Total	**6.5**	**3.6**	**3.5**	**3.2**	**3.2**	**20.00**

3. Polyculture of *Labeo gonius* with Carp

Labeo gonius

Labeo gonius is the common species of minor carp. The habitat of *Labeo gonius* is throughout northern and eastern India. This medium sized carp is planktivorous in feeding habit feeding on submerged weeds and breeds like other Indian carps in inundated rivers during the monsoon. It prefers to inhabit shallower portions of the water, where there is plentiful growth of submerged weeds. It is locally known as "Kha Ski". Presently, its stock in the river system and other water bodies is diminishing and its introduction as a cultured species will serve for its propagation and conservation. The species has a high market value of ₹ 200 – 250/- per kg. Polyculture of *Labeo gonius* with the different major carps such as catla (*Catla catla*), silver carp (*Hypophthalmichthys molitrix*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus mrigala*) will be introduced in an experimental basis in all the 7 (seven) districts of the state. On successful results, the projects will be expanded on commercial basis, thereby increasing fish production and also the income of the fish farmers. During the 5 years period of the Mission, it is targeted that about 20 ha will be covered with 200 fish ponds (approx) of 0.1 ha each. Financial Assistance will be provided to the interested fish farmers at 60% subsidy, 25% bank loan and 15% own contribution, thereby involving the total investment cost of ₹ 187.60 lakhs. Cost and assistance is as per table 8.11.

Table 8.11: Cost and assistance components of individual pond of 0.1 ha for polyculture of *Labeo gonius* with carps

Item	Specification	Value (₹)
Area of the Pond (m^2)	1000	-
Depth of the Pond (m)	1.5	-
Volume of the Pond (m^3)	1500	-
Earth work per worker per day (m^3)	2.5	-
Labour days for excavation	600	-
Wage rate per day (₹)	120	-
Total wage cost for excavation (₹)	600 x 120	72000
A.C. pipes	4 nos.	1500
A. Capital Expenditure		**73500**
Lime 100 kg @ ₹ 12/- per kg	100 x 12	1200
Raw caw dung 1000 kg @ ₹ 1/- per kg	1000 x 1	1000
Ammonium super phosphate 20 kg @ ₹ 8/- per kg	20 x 8	160
Urea 20 kg @ ₹ 8/- per kg	20 x 8	160
IMC & common carp seeds 1,400 nos. @ ₹ 2/- each (100-150 mm size)	1400 x 2	2800
L. gonius seeds 600 nos. @ ₹ 5/- each (100-150mm size)	600 x 5	3000
Feed:		
a. Fish meal 50 kg @ ₹ 25/- per kg	50 x 25	1250
b. Rice bran 50 kg @ ₹ 15/- per kg	50 x 15	750
c. Oil cake 50 kg @ ₹ 20/- per kg	50 x 20	1000
Health Care	L/S	2000
Fishing equipment	L/S	5576
Labour 12 man-days @ ₹ 117/- per day	12 x 117	1404
B. Input Cost		**20300**
C. Total Cost (A+B)		**93800**
Assistance		**56280**
Bank Loan		**23450**
Own Contribution		**14070**

Table 8.12: Distribution of individual pond of 0.1 ha for polyculture of *Labeo gonius* with carps (district-wise)

District	2012-13	2013-14	2014-15	2015-16	2016-17	Total
East Khasi Hills	0.5	0.5	0.4	0.3	0.3	**2.00**
Ri-Bhoi	1	0.5	0.5	0.5	0.5	**3.00**
West Khasi Hills	0.5	0.3	0.3	0.2	0.2	**1.50**
Jaintia Hills	0.5	0.3	0.3	0.2	0.2	**1.50**
West Garo Hills	2	1	1	1	1	**6.00**
East Garo Hills	1	0.5	0.5	0.5	0.5	**3.00**
South Garo Hills	1	0.5	0.5	0.5	0.5	**3.00**
Total	**6.5**	**3.6**	**3.5**	**3.2**	**3.2**	**20.00**

4. Culture of Magur (*C.batrachus*)

Magur

Clarius batrachus usually known as Magur is an air breathing fish well adapted to adverse ecological condition. High production of the species through mono and polyculture operation can be obtained. Its unique taste is considered a delicacy for the fish consumers. It is reported that intensive aquaculture of *C. batrachus* in the rural water bodies with very little infrastructure development can bring about socio-economic development in many parts of North- East. Since the species is a part of the natural fauna in Meghalaya, cultural practices will be much easier to follow and also the culturing will be more viable. Moreover, due to its breathing nature, the fish are generally stocked at densities of 5 – 10 times higher than the carps. *Clarius batrachus* is available in all parts of the state and can be cultured in small cemented ponds/backyard ponds and may be stocked at 50,000 – 70,000 nos. in one ha. water area. The fish attain a marketable size of 100 – 150 gms during one year culture period and will be profitable to the farmers. The minimum water area eligible will be of 0.02 ha. to a maximum of 0.10 ha. It is being targeted that 100 ha. water area with 5000 units of 0.02 ha. each will be covered. Assistance of 60% subsidy, 25% bank loan and 15% own contribution will be provided to the interested entrepreneurs. Total investment cost comes to ₹ 170 lakhs. Cost and assistance is as per table 8.13

Table 8.13: Cost and assistance components of individual pond of 0.02 ha for culture of Magur (*C.batrachus*)

Items	**Amount (in ₹)**
CAPITAL COST Earthwork in excavation of 0.02 ha to a depth of 1 m and making the embankment cemented with bricks keeping provisions for inlet and outlet	20,000.00
RECURRING EXPENDITURE Cost of inputs:	
(a) Lime 25 kg @ ₹ 12/- per kg.	300.00
(b) Raw cow dung 200 kg @ ₹ 1/- per kg	200.00
(c) Stocking of seeds 600 nos. @ ₹ 10/- each	6,000.00
(d) Formulated feed 3 quintals @ ₹ 2000/- per quintal	6,000.00
(e) Prophylactic measures against fish diseases L/S	500.00
(f) Miscellaneous L/S	1,000.00
Total	**14,000.00**
Grand Total 1 & 2 = (20,000 + 14,000)	**34,000.00**

Table 8.14: Distribution of individual pond of 0.02 ha for culture of Magur (*C.batrachus*) (district-wise)

District	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**Total**
East Khasi Hills	4	4	4	4	4	**20**
Ri-Bhoi	4	4	4	4	4	**20**
West Khasi Hills	2	2	2	2	2	**10**
Jaintia Hills	2	2	2	2	2	**10**
West Garo Hills	4	4	4	4	4	**20**
East Garo Hills	2	2	2	2	2	**10**
South Garo Hills	2	2	2	2	2	**10**
Total	**20**	**20**	**20**	**20**	**20**	**100**

8.5 Aqua Tourism/Aqua Park/Sport Fisheries

Waterfalls at Mawrap, West Khasi Hills

Aqua Park is an amusement or entertainment park that displays water play areas, such as water slides, splash pads, and other recreational bathing and swimming environments. Along with this, various types of fish in natural bodies under race ways system (in a meandering way) can be grown and displayed for attracting the tourists. Aqua parks will form part of the tourism strategy of the state. Aqua parks have both educational and recreational value.

The possibility of establishing two aqua parks, one in Khasi Hills and another in Garo Hills will be explored. The Nongkhnum island, located about 14 K M from Nongstoiñ in West Khasi Hills could be one location where aqua park can be established. It is considered as the biggest river island in Meghalaya, covering 20-25 sq.km. area. Langshiang falls, which is the third highest waterfalls in India is located about 10 KM from this island. The Naphak Lake could be a location in Garo Hills to establish the aqua park. Further survey of this particular lake and other existing lakes/locations in Garo Hills suitable for this purpose will be carried out by the Department in consultation with experts in this field.

With fast growing urban population, there is a heightened search for outdoor recreation. People of Meghalaya are known to be sport lovers, of which angling is one of them. It is appropriate to identify certain stretches and declare them as angling pockets for promoting sport fisheries and aqua/eco-tourism. The water bodies should have adequate stock of sport fishes, so as to cater to the demand of the anglers who visit these places in pursuit of angling. Such sport fisheries will undoubtedly become tourist spots and generate employment to the rural people as well as

Ranikor River, West Khasi Hills

conserve the indigenous fauna of the state. The Department will identify such suitable pockets in the rivers and develop it into sports fisheries, where all necessary infrastructures will be created. If sport fisheries is organised properly, the activity would fetch lot of revenue for the state. After developing these identified areas, they will be handed over to the communities, NGOs, Angling Associations, etc. for management. Angling will be allowed on payment of fixed fees and the revenue earned will be a benefit to the communities/NGOs etc. and towards the expenditure involved in engaging of local youth who would act as watch and ward against any poaching, indiscriminate killing of fish. Country boats including other accessories required by the patrolling personnel for patrolling of the rivers will be provided. Temporary sheds for sheltering the river guards and other patrolling personnel will be constructed near the sensitive areas of the rivers.

In Meghalaya, angling is one of the main hobbies of the people. Presence of numerous rivers/streams offer an opportunity to all angling enthusiasts including men, women, young and old to travel to far off places in search of angling adventure. Development of sport fisheries will boost the economy of the state in which hotels, restaurants, lodges, sport fishing equipments shops, etc. will be established near these angling hotspots which will cater to the local anglers as well as tourists thereby generating employment to the local youth directly or indirectly. Promoting of sport fisheries can be taken up jointly with Tourism Department.

Local anglers at Rilang River, West Khasi Hills

There are numerous angling spots in **Meghalaya** in which one of them is at Ranikor, a small town on the border of India and Bangladesh. It is one of the wild fishing spots in the state and located about 140 kms away from Shillong. The place with its immense natural beauty and innumerable fresh water fish, offers a great opportunity to be converted into one of the **angling paradise** of the state. Other rivers like Simsang in Garo Hills, river Rilang, Khri, Umngot of Khasi and Jaintia Hills are some of the known sporting sites in Meghalaya where sporting events are also being organised from time to time.

An amount of ₹ 20.00 crores is earmarked for development of this programme. The total budget for Mini Mission - VI works out to ₹ 26.43 crores.

Chapter IX

Convergence under the Aquaculture Mission

Introduction

1. Convergence refers to the successful delivery of integrated services to the people, that either did not happen, or was separately provided, by different agencies of the government. Convergence i) avoids duplication of efforts and redundant actions, ii) enables sharing of resources for common objectives, iii) enhances effectiveness of programme delivery, iv) improves quality of services provided, v) develops effective linkages with various development initiatives, vi) helps to identify new opportunities and options, vii) ensures transparency and accountability in governance and viii) results in effective monitoring of outcomes.

2. Fisheries are a sunrise sector in India, and the state of Meghalaya has immense potential for developing the fisheries. If we seek a holistic approach for the development of the fisheries sector in Meghalaya, convergence with other departments and agencies is essential. It is expected that convergence of other programmes with State Aquaculture Mission will enable better planning and effective investment in the fisheries sector. Convergence also brings synergy between different government programmes and/or schemes in terms of their planning, process and implementation.

9.1 Scope for Convergence with Aquaculture Mission

1. Convergence in the field can take place in different forms and can be of different types. Regarding forms of convergence, it could be in the **gap filling mode** utilizing viability gap funding of the Planning Department of Meghalaya. Convergence can also be in the form of **dovetailing** as in the case of MGNREGS and NWDPRA. **Value addition** takes place when the roads constructed with the MGNREGS funds are black-topped. Funding has been provided to the development of community ponds under the RSVY/BRGF in the state which may be for **scaling up** of the activities, which is another form of convergence. Often, the convergence is of the ideas, the approach and funds. The bottom line for convergence is value maximization. Convergence is of different types, such as inter-departmental convergence, intra-departmental convergence, thematic convergence, schematic convergence, financial convergence, technology convergence, etc.

2. One of the most important programmes of the Government of India with substantial scope for convergence is the MGNREGS, under the Ministry of Rural Development. There are other schemes under different Ministries, that also provide scope for convergence. MGNREGS is a wage employment programme with a focus on development of natural resources and creation of community and livelihood assets. Convergence of other departments will help improve the

quality of planning and execution of works within the MGNREGS. Convergence will also help in integrating the relevant technologies and sustainable water based livelihoods which the State Aquaculture Mission focusses on, can also be very well integrated with MGNREGS. It is therefore, envisaged that a District Level Committee be set up under the Project Director, DRDA for effecting better convergence of the MGNREGS with the Aquaculture Mission.

3. Majority of the works relating to water catchments, water conservation and water management are handled by the Department of Water Resources (DoWR) and Department of Land Resources (DoLR) under the Ministry of Rural Development. As more than 50 per cent of MGNREGS works are related to water conservation, the possibility of convergence between MGNREGS and water conservation and watershed development programmes of DoWR and DoLR will certainly optimize the durability of the assets created under the programme. The ponds, tanks and other water bodies can be developed for several purposeful activities like irrigation and fisheries, to recharge the ground water table as also to provide livelihood options through Fisheries.

4. Water has been at the core of various developmental schemes initiated by the different ministries of the Government of India. Consequently, there have been a number of schemes initiated by different line departments, which have as their critical component, water conservation and water management. Watershed development projects are being implemented in different parts of the country under three programmes, viz., Integrated Wasteland Development Project (IWDP). A watershed project in a village is considered as an immensely suitable focal point for the various developmental activities to get converged.

5. Since sustainable aquaculture production revolves around water resource, water would be at the heart of the whole Mission, which has to be taken advantage of. The Mission will strive for creating sustainable water based livelihoods and for providing nutritional security for the people. The Mission will work with different line departments for a synergistic and sustainable use of water resource in the state of Meghalaya.

9.2 Convergence workshop involving stakeholders

1. A workshop on "Converging Meghalaya State Aquaculture Mission with other Departments" was organized on 28th November, 2011 at Shillong with various stakeholders. Based on the discussion during the Workshop and presentation of the group reports in the Plenary session, the following action plans are suggested for convergence under the six Mini Missions.

2. Convergence matrix for **Mini Mission I**:

Sl. No	Activity	Departments/Agencies and or Schemes that can converge with Aquaculture Mission	Actions proposed under the Mission	Sources of funding
1.	**Area expansion through individual ponds**	Horticulture Mission (Dept of Agriculture) MGNREGS (C&RD) NWDPRA (Agriculture Department) IWMP (Soil &Water Conservation)	-New guidelines on convergence for use of water bodies to be prepared -Consensus on use of water bodies for fisheries -Technical training on fisheries to water user associations -Technical Training on Fisheries to the officials of the line departments. -Supply of inputs by the Fisheries Department	TMNEH, MGNREGS, NWDPRA, IWMP, MSAM
2.	**Area expansion through community ponds**	As above. All the four departments mentioned above would be required to converge for this purpose. Additionally the Cooperation Department would be encouraged to participate in the process	-As above- -Additionally, Capacity building initiatives for the fishery cooperators.	TMNEH, MGNREGS, NWDPRA, IWMP, Programmes of the RCS, Meghalaya.
3.	**Reclamation of marshy areas**	MGNREGS (C&RD) NWDPRA (Agri Dept)	-As above-	MGNREGS, NWDPRA, Soil & Water Conservation Department, MSAM
4.	**Productivity enhancement of reservoir fisheries**	Dept of Tourism MECL	Rights of fishers to be ensured, Capacity building of the community around the reservoirs. Formation of cooperatives of the fishers around. (RCS)	Tourism Department, NEC, MSAM
5.	**Stocking of fingerlings in lakes and other smaller water bodies**	NWDPRA (Agri Dept) IWMP (S&W C) MRDS, NERCOMP	Supply of inputs Capacity building for non-fisheries officers	MGNREGS NWDPRA MRDS/IFAD

3. Convergence matrix for **Mini Mission II**:

Sl. No	Activity	Depts / Schemes that can converge with Aquaculture Mission	Actions proposed under the Mission	Source of funding
1.	Fish seed production through Government hatcheries	RKVY (Agri Dept) NFDB (Central Govt)	Strengthening /upgrading of hatcheries	RKVY NFDB
2.	Development of fish markets	BADP (State govt) NFDB (Central Govt) DRDA (C& RD dept)	Upgrading the existing markets/creation of new markets with modern facilities	NFDB SPA
3.	Construction of link/approach road in fishery clusters	BADP (State govt) DRDA (C& RD Dept)	Land to be acquired and NOC from headman	BADP SPA
4.	Establishment of multi facility centres in fishery villages	BADP DRDA	To be implemented in collaboration with district administration	NFDB
5.	Strengthening of fish farmers co-operative societies	Department of Co-operation NCDC	Capacity building of co-operators	NCDC

4. Convergence under **Mini Mission III**:

Sl. No	Activity	Depts / Schemes that can converge with Aquaculture Mission	Actions proposed under the Mission	Source of funding
1.	Identification and survey of endangered species	St. Anthony's College ICAR institutes Civil society organizations	A core team to be developed, Capacity building	Aquaculture Mission
2.	Media campaigns on conservation	St. Anthony's College CSOs, Print and electronic media, Private media houses, MBDA, MRDS	A Media Cell to be set up for producing skits, drama, videos, etc	Aquaculture Mission
3.	Orientation workshops for the community	St. Anthony's College, MRDS, SIRD	Mobile teams for conducting workshops Legislation on conservation	Aquaculture Mission
4.	Creation of fish sanctuaries and development of parks with other infrastructure	Dept of Tourism, DRDA MBDA, MRDS, NGOs	Potential sites for sanctuaries to be identified by dist admn. Awareness campaigns Capacity building	MBDA VGF NEC
5.	Establishment of fish sanctuary for rearing and breeding of local species of fish	IWMP (S&WC) RKVY (Agri dept)	Capacity building for non-fishery officers	RKVY

5. Convergence under **Mini Mission IV**:

Sl. No	Activity	Depts / Schemes that can converge with Aquaculture Mission	Actions proposed under the Mission	Source of funding
1.	Training Needs Assessment	SIRD, St. Anthony's College, ICAR institutions	Study to be commissioned after the first year of trainings	Aquaculture Mission
2.	Designing of Training Plan	-do-	Preparation of annual training calendars	-do-
3.	Training of Trainers (ToT) programme	-do-	Development of Master trainers for the Mission	-do-
4.	District level workshops	MRDS, DRDA	Mobile teams for awareness creation will be developed	DRDA, MRDS
5.	Exposure visits of officers and farmers (other states)	ICAR institutes, Fisheries Colleges, Private institutions, Progressive farmers	Demonstration farms to be developed in the state based on exposure visits	Aquaculture Mission
6.	Training of officers of Fisheries dept	ICAR institutes, Fisheries Colleges, St. Anthony's college, NIRD, IIE, IIM (B)	Capacity building on Project management, MDP, Technology management	-do- NFDB
7.	Training for fish farmers	ICAR institutes, St. Anthony's college, SIRD, MRDS, RRTC	To be conducted by the Master trainers at district level	-do- NFDB
8.	Establishment of Capacity Building & Training Management unit at HQ	ATMA, NFDB, DoPT	Creation of a Training unit Training infrastructure at HQ	DoPT NFDB
9.	Production of IEC materials	SIRD, NIRD, St. Anthony's College, ICAR institutions	Strengthening of Media Cell to be established by the Mission	Aquaculture Mission
10.	Mapping of training institutions	SIRD, DRDA	Inventory of training infrastructure in Meghalaya	-do-
11.	Infrastructure devt for training	NFDB,RKVY, ATMA	Establishment of training centres	RKVY, ATMA
12.	Conduct of orientation workshops for the prospective farmers	SIRD, St. Anthony's College, ICAR institutions	To be conducted by the Master trainers at district level	Aquaculture Mission
13.	Upgrading capacities of fish co-operators	SIRD, St. Anthony's College	Technical trainings, EDP trainings	NCDC
14.	Skill trainings for self employment	RRTC, SIRD, St. Anthony's College	Conduct of skill trainings for ornamental fisheries, aquarium fabrication centres	Aquaculture Mission

6. Convergence under **Mini Mission V**:

Sl. No	Activity	Depts / Schemes that can converge with Aquaculture Mission	Actions proposed under the Mission	Source of funding
1.	Mass mobilization campaigns	DRDA, MRDS, NGOs, media institutions	Will be organized involving DRDA and district administration at block level	Aquaculture Mission
2.	Publicity through mass media campaigns	DRDA, MRDS, NGOs, media institutions, Dept of I &PR	Newspaper advertisements, news reports, radio announcements, local cable telecasts	-do-
3.	Documentation of success stories of fish farmers	MBDA, MRDS, NGOS, media institutions	Videos on successful farmers and events will be produced	-do-
4.	Conduct of fish mela/festivals	Dept of Tourism, DRDA, Wild life, NGOs, media institutions	Publicity by the Mission, participation of travel industry	Funds from Tourism dept

7. Convergence under **Mini Mission VI**:

Sl. No.	Activity	Depts / Schemes that can converge with Aquaculture Mission	Actions proposed under the Mission	Source of funding
1.	Water sports in identified locations under PPP mode	Dept of Tourism, C & RD, MECL, MRDS, NGOs, DRDA	-Joint Publicity by Mission and Department of Tourism -Participation of travel industry	Aquaculture Mission, Funds from Tourism
2.	Eco lodges, trekking, bird watching in wet lands	Dept of Tourism, DRDA, Wild life, NGOs	-Joint Publicity by Mission and Department of Tourism -Participation of travel industry	Funds from Tourism
3.	Setting up large aquariums (Ornamental fish) in tourist destinations	Dept of Tourism, MPEDA, NFDB	Private entrepreneurs can be outsourced for establishing large aquariums	NFDB Funds from Tourism
4.	Establishing aqua parks adjacent to reservoirs and large water bodies	-do-	-Joint Publicity by Mission and Department of Tourism -Participation of travel industry	Aquaculture Mission, Funds from Tourism
5.	Popularizing trout farming	National Research Centre for Coldwater Fisheries, Progressive farmers	Encouraging trout farming in potential areas	NFDB
6.	Popularizing freshwater prawn culture	CIFA, Progressive farmers, NGOs	Encouraging freshwater prawn farming in potential areas	NFDB

9.3 Convergence of funds

For funding of activities under the Aquaculture Mission, the following measures will be adopted.

1. Funds for similar works under different schemes will be converged to the extent possible. For instance, construction of water bodies under IWMP of Soil and Water Conservation Department and construction of water bodies by the Department of Water Resources.
2. Programmes that allocate funds under the same head may be identified and such programmes will be converged. For instance, six programmes of the Government of India have a budget for "Capacity development"- Watershed programme, MGNREGS, BRGF, NFSM, RKVY and NHM. A common training programme can be designed for these schemes and thus the funds could be converged. An attempt of convergence in this direction will be done.
3. Provisions under certain schemes for gap filling will be utilised. For instance, BRGF will be used to bridge vital gaps in local infrastructure and other development requirements that are not being adequately met through existing funds. Similarly, VGF (viability gap funding) will be used for filling the gaps in funding. Infrastructure Gap Filling Fund could be created for local infrastructure development in similar lines as done by the Government of Tamil Nadu under RD & PR Department. It is proposed to create a corpus fund of ₹ 50 crores to fund convergence initiatives from other departments. Guidelines for utilization of the convergence will be issued by the Aquaculture Mission.
4. Convergence of funds for facilitation of ecological synergies under various schemes under NRM, NICRA (National Initiative on Climate Resilient Agriculture), Water Mission, etc will also be planned.
5. Convergence of funds from public sources and private agencies will be tapped for schemes related to tourism and construction of feed mills (for projects under PPP mode).

9.4 Cases of convergence in vogue

There are cases of convergence taking place in the field, some by default and others by design. Some of the instances of convergence taking place are:

1. In Nongbareh village in Jaintia hills, where a small check dam was constructed across one part of the Amlaye river has been declared as a Fish Sanctuary by the people of that village. The endangered chocolate mahseer species is also being conserved and has now populated the entire stretch of the river.
2. One NGO (Rombagre Natural Management Resource group) has been striving in conserving the indigenous aquatic resources of the Simsang river (Garo hills) located on the Tura-Williamnagar road. It has become a popular tourist spot as the visitors passing through this place are fascinated with the fishes being conserved. In the Rombagre Fish sanctuary, the view point platform and approach footpath were constructed by the

Tourism department, and the revenue generated by way of entry fee is utilized for the maintenance of the reservoir. This is a good case of convergence of Tourism department with the Fisheries department in achieving the objective of mahseer conservation.

3. The Aquaculture Mission will jointly work with Department of Tourism and Department of Water Resources for conservation of fish species as well as establishing sanctuaries in the state. The Mission will also work in close collaboration with the DRDA and other development agencies related to convergence of activities, for which an amount of ₹ 50.00 crore is earmarked as Convergence Funds.

Chapter X

MIS and Knowledge Management

Introduction

1. Management Information System (MIS) provides information needed to manage organizations efficiently and effectively. Management information systems involve three primary resources: people, technology, and information. Management information systems are distinct from other information systems in that they are used to analyze operational activities in the organization. Initially in businesses and other organizations, internal reporting was produced manually and only periodically, as a by-product of the accounting system and with some additional statistic(s). It also gave limited and delayed information on management performance. Data were organized manually according to the requirements and necessity of the organization. As computational technology developed, information began to be distinguished from data and systems were developed to produce and organize abstractions, summaries, relationships and generalizations based on the data.

2. Early business computers were used for simple operations such as tracking sales or payroll data, with little detail or structure. Over time, these computer applications became more complex, hardware storage capacities grew and technologies improved for connecting previously isolated applications. As more and more data was stored and linked, managers sought greater detail as well as greater abstraction with the aim of creating entire management reports from the raw, stored data. The term "MIS" arose to describe such applications providing managers with information about sales, inventories, and other data that would help in managing the enterprise.

3. The successful MIS supports the Mission's long range plans, providing reports based upon performance analysis in areas critical to those plans, with feedback loops that allow for iteration of every aspect of the enterprise, including recruitment and training regimens. MIS not only indicates how things are going, but why and where performance is failing to meet the plan. Instant availability of information and accurate, credible date are very important in order to make correct decisions and to design a clear strategy to achieve the critical goals.

10.1 MIS for Meghalaya State Aquaculture Mission:

MIS needs to be introduced in the Aquaculture Mission so that all relevant data are collected, stored and retrieved timely, while planning, executing, monitoring, and evaluating the mission. The MIS of the Aquaculture Mission will address the following issues:

1. **Registration of Beneficiaries:** All the relevant personal/group data of the beneficiaries would be fed into the MIS viz. name, EPIC ID, photo etc. The details of registration will

include the location details, the types of ponds, species of fish, production capacity, method of rearing, harvesting cycle, quarterly turnover, repayment cycle and status of the scheme with respect to each beneficiary. Facility performance is reported to the user as management schedules, summary reports, budgets and graphical compilations of data. Facility specifications include items such as facility location or climatic regimes, source water variables, components and configurations of water transport, water treatment, fish culture systems, management strategies, and production objectives.

2. **Financial Data:** The financial template would be made available for collecting the financial data at all levels i.e. state, district and beneficiary. The financial template would capture financial data related to the following:
    i. Receipts
    ii. Disbursement/Sanctions
    iii. Administrative Expenditures
    iv. Any other expenses
3. **Reports:** The MIS would be able to generate State/District and beneficiary level reports as and when needed. The types of reports would include:
    i. Total number of beneficiaries
    ii. Total number of water bodies
    iii. Types of fish in a particular District
    iv. Fish production on a monthly/yearly basis
    v. Information on each beneficiary
    vi. Any other information as required
    vii. Alerts raised by MIS relating to implementation, if any
4. **Management decisions:** The data collected can be thoroughly analyzed for monitoring and evaluating the progress of the Mission. Analytical reports can assist the Aquaculture Mission team in taking decisions and formulate techniques for improvement in gray areas. The analysis can be carried out only when credible data is collected. The MIS can add-on formats which spell out the data which has to be collected from the field. These formats have to be carefully thought upon as they would be one-time entered into the software and can be utilized gauging the various aspects of the Mission. For e.g. if we collect the output of each and every pond, we can analyze the productivity of the water bodies. This data when collected for a series of months/years, can help gauge the increase/decrease in productivity of the water bodies. If data suggests that there is a deviation from the expectations, studies/analytical techniques can be used to detect the problems or perhaps otherwise. Similarly, several other formats can also be prepared to collect data on fish growth, disease patterns, feed quality and quantity, season wise productivity cycle, revenue generated etc.

Analysis of data can definitely bring upon a progressive and calculated approach while taking management decisions.

10.2 Software Design Specifications for the MSAM:

The main objective of this document is to illustrate the requirements of the MIS and Knowledge Management component of the Meghalaya State Aquaculture Mission. The final product, that is, the development and application of a software product for the Meghalaya State Aquaculture Mission's design and management planning will contain any and all of the following data which are tentatively indicated. It will be further refined based on the discussions with the developers and stakeholders time to time.

1. The registration will include the location details, types of ponds, species of fishes, production capacity, method of rearing, harvesting cycle, quarterly turnover, repayment cycle and status of the scheme with respect to each beneficiary.
2. Data on facility and aquaculture management practices;
3. Compilation of facility resource and enterprise budgets; and
4. Graphical user interface and data management capabilities.

    a. **Users**: Data entry under the proposed system will be carried out at the State and the District level using trained manpower. The proposed application would be a website where data entry will be done in an online mode. All details of the State Aquaculture Mission will be available online as and when required. Reports generated by the system can be printed and made available. The website created needs to be compatible with any Web Browser. The proposed system must be designed to allow extensibility during later stage of implementation.

    b. Since the proposed system would be used at both the State and District level, security of the system is very vital for the proper functioning of the system. There will be different levels of users. Depending upon the various rights, different users will have different rights and each user would have their own User Identification and password to access the system.

    c. The Software will allow sending of all the data related to State Aquaculture Mission of each District to the Central Database. Data flow in the proposed System should be controlled by the Specialized and trained personnel from the State as well as District Levels. The Software would be able to generate various types of reports for all levels of users as demanded. The website user interfaces are required to be user friendly.

10.3 ICT Requirements for the MIS:

1. **Database Server:** The successful functioning of the system is heavily dependent on the stored data which is needed to be a centralized database. Well structured database need to be

created and maintained by the NIC. All data will be stored as well as processed through this Centralized Database.

2. **Network Requirement:** As the Software is online based, Internet Connectivity is vital. This can be availed by providing Broadband connectivity to the State and Districts headquarters. If Broadband Connectivity is not available, VSATs can be installed in the Data Centre. The VSATs can be availed by calling for RFP and selecting the vendor as per the requirement and technical specifications desired by the NIC.

3. **Hardware Requirement:** Hardware arrangements need to be made at both the State and the District Level with LAN features.

    a. **Server** - At the State Data Centre which is to be hosted and maintained by NIC

    b. **Desktop PCs or Laptops** – At the State and District Administrator level.

    c. **Printers, Scanners**, **UPS** - As per the requirement to be worked out in due course of time, through an accurate and detailed analysis.

    d. **LAN Peripherals:** Devices like switch/Hub, RJ-45 connector, LAN Cables, LAN Cards.

    e. **Internet Connectivity** through VSAT or Broadband Connectivity is essential.

    The hardware configuration specification needs to be specified by the software development team. The system requires a database in order to store persistent data so the database should have backup capabilities.

4. **Need for Professional support:** For managing the database, entering of data, trouble shooting and all other similar activities have to be carried out by personnel recruited at the State and District levels. The administrators at two levels shall work under the MSAM.

1. **State Level Data Administrator:** The Administrators of the System at the State level include State Data Manager and Data Entry Operator.

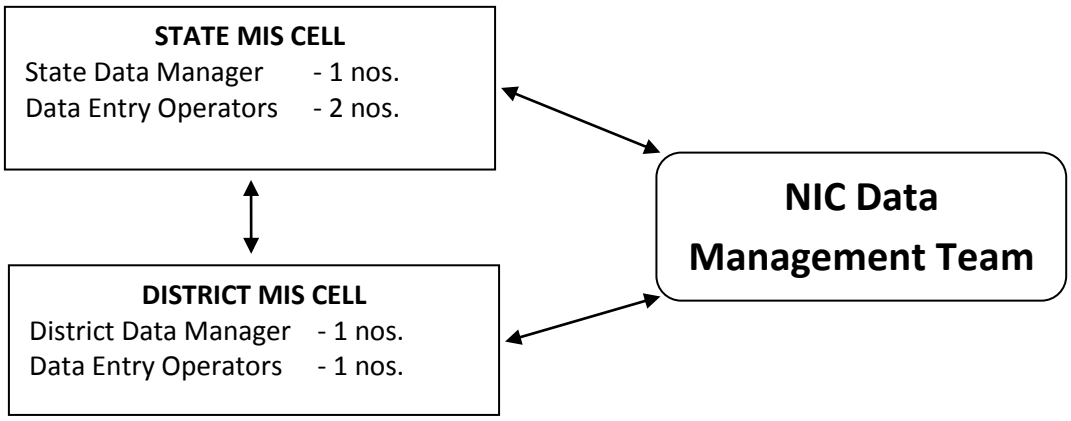
2. **State Data Manager**- One person will be engaged on contractual basis having qualification of BE / BTech Computer Science / IT / Related fields or MCA or as per requirements laid down by NIC with a consolidated pay of ₹ 25,000/- to ₹ 30,000/- per month.

3. **Data Entry Operators** - Two graduates with computer knowledge or as per requirements laid down by NIC at a consolidated pay of ₹ 8,000/- to ₹ 10,000/- per month will be engaged on contractual basis.

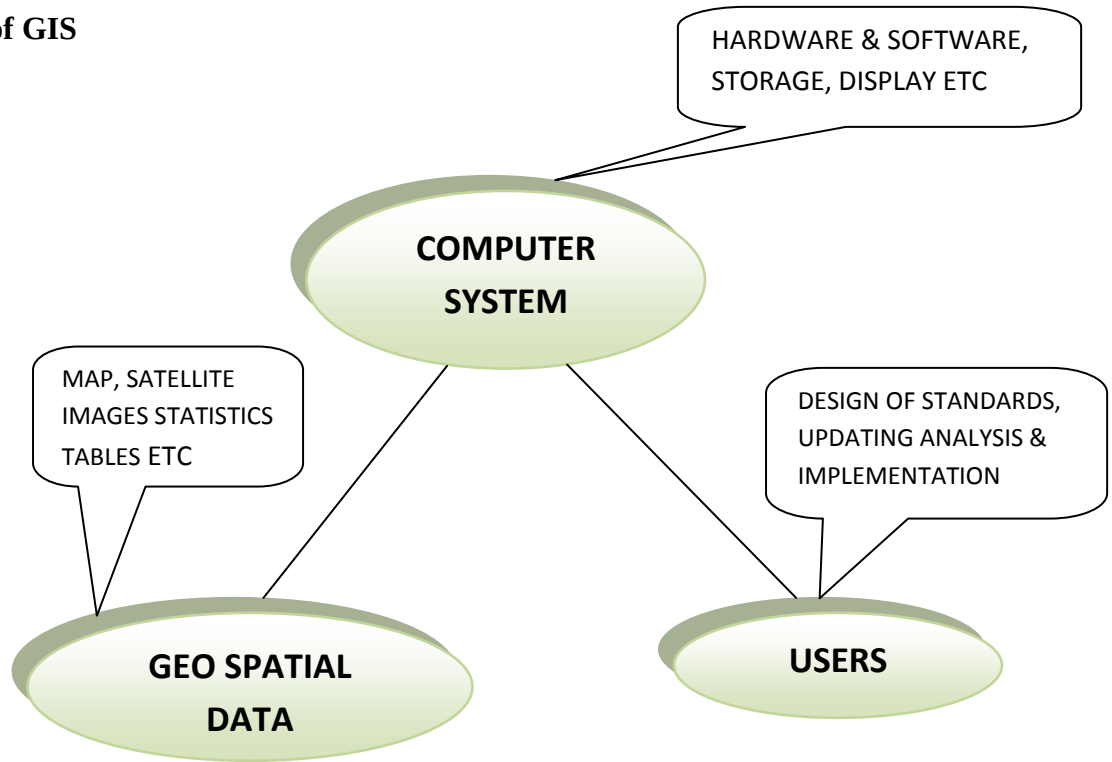
4. **District Level Data Administrator:** The administrators of the System at the District level includes District Data Manager and Data Entry Operator

5. **District Data Manager** – One person having the qualification of BCA / BSc (Computer) / 'A' Level DOEACC or as per requirements laid down by NIC will be engaged on contractual basis in each district with a consolidated pay of ₹ 15,000/- per month.

6. **Data Entry Operator**- One graduate with computer knowledge or as per requirements laid down by NIC will be engaged on contractual basis with a consolidated pay of ₹ 8,000/- to 10,000/- per month.



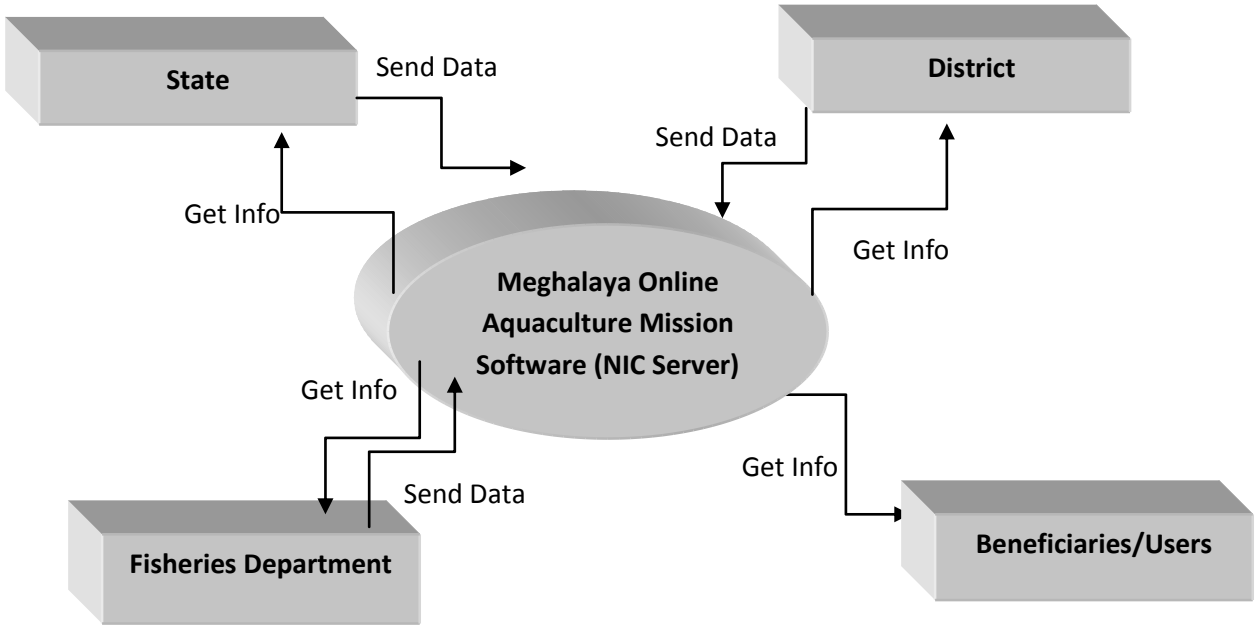
5. **Use of GIS**



1. GPS

The use of Geo Positioning System (GPS) would be beneficial in identifying the location of the water bodies and calculating their size. The water bodies will be allotted a registration number which is also tagged to the Beneficiary. In the later stages, the use of Geographical Information System (GIS) and remote sensing can be thought of. This would make available data i.e. Location, size, types of water bodies and other important data, on a map which can be displayed/viewed at any point of time. This would require close coordination with remote sensing agencies which have access to satellite data like North East Space Application Centre (NeSAC), Umiam and the Geo Spatial Technology Mission authorities in Delhi.

Context Level Diagram



SCHEDULING FOR IMPLEMENTATION OF MIS - MEGHALAYA STATE AQUACULTURE MISSION

Sl. No.	Schedule Name	Tasks	Duration to complete the Task/Proposed Estimated time for completion of the Task	Depends On
1.	SOFTWARE DEVELOPMENT	Development of the Online Website for Meghalaya Aqua Culture Mission	6 Months	The Mission website will be hosted, designed and maintained by the NIC Shillong in coordination with the State Level Data Management Cell. Maintenance will be done by NIC as well as the personnel engaged at State and District level.
2.	SOFTWARE TESTING	Testing the developed software thoroughly for finding bugs and performing error corrections	2 Months	The development team shall be responsible for testing the application.
3.	ICT INFRASTRUCTURE	Internet Connectivity (VSAT/Broadband) Network in State as well as District Level office building	2 Month	In District where BSNL Broadband is available, it should be preferred. In District where Broadband is not available, VSATs can be procured by calling RFP.
4.	PERSONNEL	Recruitment of State Level as well as District Level Personnel	1 Month	-
5.	TRAINING	Training for Personnel both at State as well as District Level	1 Month	Training to be conducted by NIC.

COST ESTIMATION FOR IMPLEMENTATION OF MIS IN MEGHALAYA STATE AQUACULTURE MISSION

(a) Hardware Cost Details

Head of expenditure	Item Name	Cost/Unit (in ₹)	Quantity		Total Cost (in ₹)		
			State	District	Nonrecurring	Recurring	Annual Recurring charges
ICT Equipments	Desktop PC	45,000/-	3	14	7,65,000/-		
	UPS	5,000/-	3	14	85,000/-		
	Printer (B&W)	10,000/-	1	7	80,000/-		
	Scanner	8,000/-	1	7	64,000/-		
	LAN Equipments	10,000/-	1	7	80,000/-		
	VSAT Hardware	50,000/-	0	6	3,00,000/-		
Internet Connectivity	VSAT Monthly Charges	10,000/-	0	6	-	60,000/-	7,20,000/-
	BSNL Broadband (One time payment)	5,000/-	1	1	10,000/-		
	BSNL Broadband Connection Monthly Charges	3,000/-	1	1	-	6,000/-	72,000/-
				Total Cost	**13,84,000/-**	**66,000/-**	**7,92,000/-**

(b) Personnel Cost Details

Head of expenditure	Post	Salary/Month (in ₹)	Total No.(s)		Monthly Expenditure on salary (in ₹)	Annual Expenditure on salary (in ₹)
			State	District		
Personnel	State Data Manager	25,000/-	1	0	25,000/-	3,00,000/-
	District Data Manager	20,000/-	0	7	1,40,000/-	16,80,000/-
	Data Entry Operators	10,000/-	2	7	90,000/-	10,80,000/-
				Total Cost	**2,55,000/-**	**30,60,000/-**

Estimated Cost for implementation of MIS in Meghalaya State Aquaculture Mission

1. One time charges for purchase and installation of hardware = ₹ 13,84,000/-
2. Monthly Recurring Charges for Internet Connectivity and Personnel = ₹ 3,21,000/-
3. Annual Recurring Charges for Internet Connectivity and Personnel = ₹ 38,52,000/-

Cumulative Recurring Annual Expenses Detail for a Period of 5 Years

Recurring Expenses Head	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Total Cost (in ₹)
Installation Charges	13,84,000/-	-	-	-	-	13,84,000/-
VSAT Rental and Connectivity Charges	7,20,000/-	7,56,000/-	7,93,800/-	8,33,490/-	8,75,164/-	39,78,454/-
BSNL Rental and Connectivity Charges	72,000/-	75,600/-	79,380/-	83,349/-	87,516/-	3,97,845/-
Salary Expenses	30,60,000/-	33,66,000/-	37,02,600/-	40,72,860/-	44,80,146/-	1,86,81,606/-
Total Recurring expenses for a period of 5 Years						2,44,41,905/-
Contingencies 5%						12,22,095/-
Total Estimated expenses for implementation of MIS on Meghalaya State Aquaculture Mission						2,56,64,000/-
(Amount in words: Two Crore Fifty Six Lakh Sixty Four Thousand Only)						

- Internet and VSAT expenses: 5% increase from 2nd year onwards
- Salary: 10% increase from 2nd year onwards
- Contingencies include consumables

Chapter XI

Monitoring and Evaluation

Introduction

Monitoring and evaluation should be an integral part of the project design because it provides an opportunity for intervention during implementation and mid-course corrections. The programme consists of six Mini Missions with clearly set goals. Monitoring and evaluation is the driving force to see that the programme is moving in the right direction and the expected goals are achieved. While monitoring is a continuous assessment of project implementation, evaluation is a periodic assessment of efficiency. Monitoring and evaluation play complementary role rather than competitive role. Monitoring focuses on routine collection of information but evaluation focuses on critical analysis of the information. Monitoring focuses on tracking project implementation progress whereas evaluation provides ex-post assessment of effectiveness and impact. Monitoring measures efficiency in implementation, but evaluation attempts to confirm project expectations and bring out the impacts.

Monitoring will help in assessing the effectiveness of implementation and evaluation will help in understanding to what extent the expected goals are being reached. The evaluation system will answer two basic questions. What types of interventions are successful and why? What improvements in project interventions maximize the outcomes?

This chapter is devoted for suggesting the system of monitoring and evaluation for the MSAM. The chapter is organized in three sections. The general approach to monitoring is presented in Section II. The design of the monitoring and evaluation of MSAM is discussed in Section III. A brief summary of the chapter is presented in Section IV.

11.1 Steps in Designing Monitoring and Evaluation System

There is shift in the focus of monitoring and evaluation in recent times. Earlier the focus was on implementation process and now it is on tracking the results. The implementation process monitoring concentrates on tracking input mobilization, activities undertaken and completed and outputs delivered. The result-based monitoring adds project outcomes to the key features of implementation-based monitoring.

Impacts are expected to begin after the completion of implementation. Impacts may be positive or negative, primary or secondary (long-term), intended or unintended. For instance, improvement in the survival of fingerlings, increase in the average size of the fish are the intended primary effects. If the development of fish ponds results in entrepreneurial skills in other areas of livelihood, it is a secondary benefit. The construction of the pond may result in cultivation of high valued crops like vegetables in the dry season. It may improve ground

water potential in the area because of the percolation from the ponds. These are all positive impacts. There may be sometimes negative effects like adverse effect on the agricultural lands adjacent to the pond. The long term effects are expected to begin five years of the completion of the project. The farmers assisted under the Mission may expand their activity or may diversify into other areas of livelihood.

There are five steps in designing the monitoring and evaluation system. These are:

1. Establishing the purpose and scope

Why do we need M & E? Instead of starting with indicators of performance, we should first identify performance questions. This helps us to focus the information gathering on what we actually need for understanding and improving project performance. Identifying performance questions is iterative. First, we identify the questions, then assess the feasibility of getting information and then accept or reject it. Then we take up other questions for consideration. In other words, every question is selected on the basis of the feasibility of information.

2. Identifying Information Needs and Questions

Using our performance questions, we can more easily identify useful indicators and other information needs for which we can collect data. Only data that helps us answer performance questions are necessary. This helps us to collecting information which is needed.

3. Collection of Base Level Information

We have to think of the need for base level information to answer the questions. If there is no need of base line information to answer the question or the base level information is already available, it need not be collected.

4. Selection of Data Collection Methods

Once we have decided what information is to be collected and what indicators are to be used, the next step is to decide the methods of data collection. Each method has its own cost implication and provides information of varying degrees of accuracy. We can use more qualitative information or quantitative data. We may adopt participatory methods or individual household survey.

5. Organizing Analysis, Feedback and Change

The data have to be analyzed and feedback has to be given to the decision-making levels so that they can make mid-way corrections.

11.2 Monitoring and Evaluation System for MSAM

The MSAM will organize monitoring in two steps and evaluation again in two steps. The first step in monitoring is conducting base line census survey of all the beneficiaries to obtain their socio-economic characteristics. This information will be computerized properly in

ACCESS or DBASE or SPSS format. This will be useful for further evaluation studies. The second step will be collection of information for the MIS. This will be useful to understand the progress of implementation. This will be a census of all the beneficiaries. A simple questionnaire will be designed and the data entry formats will also be prepared so that data can be computerized and stored.

Evaluation will be entrusted to a third party and it will be done at three stages. The first stage evaluation will be at the end of the first year. This will help to identify the deficiencies in implementation. The report should be completed in four months so that corrective steps can be taken in the implementation during the second year. This report will be confined to the area expansion. The second evaluation will be the mid-term evaluation. This will be taken up after the completion of the second year. This will focus both on the implementation problems as well as the benefits derived by the farmers. The suggestions made in this report will be useful for the implementation of the scheme in the fourth and fifth years. The third monitoring report will be at the end of the fifth year. This will cover the beneficiaries of different years so that long term benefits can also be identified.

11.3 Questions to be raised for first year end and mid-term evaluation

On pond excavation

Was labor available at the wage rate prescribed by the Mission?

Was the work of pond digging completed in 600 days?

How much family labour was used in digging the pond?

Were the funds released at the right time for pond excavation?

Supply of fingerlings and other initial inputs

How much expenditure was incurred for lime, dung and fertilizer?

How many fingerlings are supplied?

Was there any mortality at the time of supply itself?

What is final mortality of fingerlings?

Supply of feed and disease management

Was the feed supplied at the appropriate time?

Was the quality of feed supplied satisfactory to you?

How much of each feed was supplied to you?

Have you given any additional feed in addition to the feed supplied?

Was there any occurrence of diseases for the fish?

How much amount have you spent on disease management?

Harvesting and marketing

Have you harvested the fish at the appropriate time?

How is harvesting operation carried out?

How much labour is used for harvesting?

What is the average weight of the fish harvested?

How much of the fish is used for home consumption and how much is sold?

Have you faced any problems in marketing?

What is the income obtained from the fish in your pond?

11.4 Sample Size and Cost Estimate for Evaluation Studies

The sample size for the evaluation study at the end of first year will be 1000 farmers. It is expected that after the scrutiny at least 900 questionnaires will be available. There will be proper representation for different districts. The study will be conducted in four districts, two from Khasi-Jaintia districts and two from Garo districts. Blocks with large extent of area will be selected for the study.

The mid-term evaluation will cover 1500 households and the final evaluation will cover 1500 households. In this survey more representation will be given for the areas not covered in the first year end survey.

The final impact evaluation will be carried out after the completion of the Mission. In this evaluation samples will be drawn from farmers of first three years so that impact can be clearly measured. The villages covered in the first three years will be taken for the study.

In addition to conducting the sample survey, some villages not covered under the survey will be identified and PRA will be conducted for qualitative their assessment of the programme. This can be treated as a substitute for Social Audit. The only difference is that this exercise will be confined to a few villages.

The agency for conducting these studies will be identified in the first six months of the Mission so that they can also get acquainted with the activities of the Mission. The data collected in various surveys including the base line survey. The budget for these surveys can be decided at a later stage. The agency should take the responsibility of computerising the Base line survey data which will be a permanent record for any future use. A tentative estimate is ₹ 28 lakhs for each study and ₹ 16 lakh for the computerization of baseline data of one lakh farmers. Thus the total cost of engaging the third party for monitoring evaluation will be ₹ 100 lakhs for all the three studies.

11.5 Summary and Conclusions

Monitoring will help in assessing the effectiveness of implementation and evaluation will focus on the achievement of objectives. The evaluation system will answer two basic questions. In recent times the focus of monitoring and evaluation is broadened by including the results.

Area expansion being the main component and is crucial for poverty alleviation, it should be monitored regularly. One part of monitoring will be carried out by the FFDA and the other part by the third party. The monitoring of FFDA will confine to collection of information about the socio-economic background of the beneficiaries, updating the information in the web based MIS and preparing the quarterly progress reports.

The second part of the monitoring will be carried out by an independent agency. This part will help to identify if any mid-course corrections are needed and whether the goals set initially are reached. This part will be given to a third party and the issues to be studied will be jointly decided. This part of evaluation will be conducted three times, one at the end of the first year to suggest also mid-way corrections in the implementation, the second after completing two and half years and the final one at the end of the fifth year. The agency is expected to prepare the soft copies of the baseline survey data and also the data collected by the agency in the three evaluations. A tentative estimate for third party evaluation is put at ₹ 100 lakhs which will be set aside for the purpose.

Chapter XII

Economic Appraisal of Meghalaya State Aquaculture Mission

Introduction

Inclusive growth being the major goal, the Meghalaya State Aquaculture Mission aims at construction of one lakh individual fish ponds at a total cost of ₹ 904.99 crores in order to enhance fish production and provide supplementary sources of income and employment. A major share of this investment (60 per cent or ₹ 540 crores) will be provided by the Government of Meghalaya in the form of assistance. The commercial banks will provide 25% or ₹ 225 crores in the form of loan to the beneficiaries and the balance amount of ₹ 138.99 crore, forming 15 per cent of the total investment will be contributed by the beneficiaries. Each individual farmer is spending about ₹ 36000/- either out of own funds or borrowed amount. Two aspects have to be considered before undertaking this investment. One aspect is the increase in the annual income of the farmer. The second aspect is economic viability of the investment. To examine the former aspect, the income stream to the farmers resulting from the investment has to be derived. The latter aspect can be examined by undertaking Social Benefit Cost Analysis (SBCA).

This chapter focusses on the above two aspects. Section II is devoted to examine the impact of the scheme on the incomes of the marginal and small farmers. Section III provides economic analysis of the individual pond scheme. This analysis provides various measures of project appraisal and also the impact of the project on rural employment. Since any analysis of the future is fraught with uncertainties, as is customary in the SBCA, sensitivity analysis is carried out in order to understand the viability of the programme under uncertainties. The results of the sensitivity analysis are presented in Section IV. Summary and conclusions of the chapter are presented in Section V.

12.1 Income Gain to Marginal and Small Farmers

Calculation of income gain to the farmers has to be done carefully because a part of the gain to the farmer comes from income transfer and another part in the form of return for the investment. In other words, the Government of Meghalaya is extending support not only for asset creation but also for meeting the input costs as all the farmers are expected to be marginal or small farmers. The scheme is made pro-poor and self targeting by restricting the size of the pond to 0.1 hectare. It is assumed that all the income generated from the scheme is incremental as there is plenty of land under small water bodies which is not under any productive use at present.

The most critical aspect in determining the income derived by the farmers is the calculation of the cost of production actually incurred by the farmer. While several concepts of cost are used in the calculation of cost of production of agricultural commodities by the Commission

for Agricultural Costs and Prices (CACP), the concept used in this analysis is akin to cost C_2. The concept includes imputed values of investment made in the form of land, labour and capital besides the cost of other inputs. However, no value is given for land because only the land not under any viable economic use will be used for the construction of fish ponds. A part of investment by the farmer comes from the funds borrowed from the commercial banks at a subsidized rate of 7% per annum. The remaining amount is contributed by the farmer. Interest on own funds is calculated at 10% per annum because their investment is mostly in the form of labour and input purchases will be spread throughout the year. Assuming the life of the pond as 20 years, depreciation of pond is taken as 5% per annum. The life of the equipment ranges between 2 to 4 years and hence depreciation is calculated at 33.3% per annum.

Income is generated at the end of each year after the construction of the pond. Income derived by the farmer varies in the first five years due to the following reasons. Firstly, financial support is provided by the government in the first year. Secondly, repayment of loan starts from the second year and closes by the fifth year. Interest is calculated on diminishing balance of the loan. Hence the installment varies year to year and it becomes a part of cost of production from second year to fifth year. The loan will be completely repaid by the end of the fifth year. Hence, income from the sixth year becomes stable and does not contain loan repayment.

The income stream from the first year to the sixth year is shown in Table 12.1. Income is calculated at constant prices. The total cost to the farmer consists of five items namely, own funds, interest on own funds, depreciation of the pond, depreciation of the equipment and repayment of loan.

The total cost in the first year, which includes capital cost and recurring expenditure, comes to ₹ 85149/-. This expenditure is met from government support to the extent of ₹ 48750/-, bank loan ₹ 22500/- and farmer's own funds ₹ 13899/-. The cost to the farmer has five items - the amount of own funds spent on inputs, interest on own funds, depreciation of pond, depreciation of equipment and repayment of loan. However, repayment of loan starts from the second year and ends in the fifth year. The total cost to the farmer in the first year is ₹ 19874/-. The output obtained at the end of the year is estimated at 240 kg under the assumption that out of the 1000 fingerlings released into the pond, 600 will survive and each fish will weigh 0.4 kg on the average. The value of output is estimated at ₹ 28800/-. Net income derived by the farmer in the first year is estimated at ₹ 8926/-.

Income in the second year is different from that of the first year because repayment of loan enters into cost calculations and there is no capital expenditure. Repayment of the loan comes to ₹ 7200/- and the need for own funds comes down to ₹ 7174/- from ₹ 13899/-. Hence, interest on own funds also comes down to ₹ 717/- from ₹ 1390/-. As a result of these changes, income in the second year increases to ₹ 9129/-. Income in the third year rises by

only ₹ 394/- because of the reduction in the loan installment. From the fourth year onwards feed support is completely withdrawn. As a result income in the fourth year comes down to ₹ 7029/- and to ₹ 7422/- in the fifth year. The farmers realize the full financial benefit from the sixth year onwards and income reaches ₹ 13441/-.

The above income stream has to be treated as minimum because the mortality of the fingerlings is assumed to be 40% which is on the higher side. With the availability of quality fingerlings supplied by the hatcheries in the state and the provision of health care, it is possible to reduce mortality to 20% in which case output increases by another 80 kg and income by another ₹ 9600/-. Thus, the impact of the scheme on poverty alleviation will depend on supply of good quality fingerlings and provision of health care.

It has to be noted that the calculation of income is made at constant prices or the prices of 2011. If prices of inputs and outputs rise in the same proportion, the absolute income of the farmer increases. While analysing the impact of the scheme on poverty, care would have to be taken to make suitable adjustments for input and output values.

It is possible to provide a rough estimate of the impact of the programme on poverty. If poverty level income is taken as ₹ 60000/- per family per year in 2012, the scheme will provide at least 25% of the poverty level income. In other words, all the households whose income falls short of the poverty line by a quarter or less will cross the poverty line. Thus, the scheme provides a reasonable supplementary source of income to the marginal and small farmers.

Table 12.1: Income Gains to the Farmers from Individual Pond Scheme

S. No.	Item	Ist Year	IInd Year	IIIrd Year	IVth Year	Vth Year	From VIth Year
Cost of construction and inputs							
1.	Cost of pond excavation	71700	-	--	-	-	-
2.	Cost of equipment	3000	-	-	-	-	-
3.	Lime, dung and fertilizer	2520	2520	2520	2520	2520	2520
4.	Fingerlings	2000	2000	2000	2000	2000	2000
5.	Feed	2625	2625	2625	2625	2625	2625
6.	Transport of inputs	400	400	400	400	400	400
7.	Health Care	400	400	400	400	400	400
8.	Labour (12 person days)	1404	1404	1404	1404	1404	1404
9.	Insurance	450	450	450	450	450	450
10.	Processing and sign board	650	-	-	-	-	-
11.	**Total Cost (1 to 10)***	**85149**	**9799**	**9799**	**9799**	**9799**	**9799**

Sources of funds							
12.	Government assistance	48750	2625	2625	-	-	-
13.	Bank loan	22500	-	-	-	-	-
14.	Own Funds	13899	7174	7174	9799	9799	9799
15.	**Total (12 to 14)**	**85149**	**9799**	**9799**	**9799**	**9799**	**9799**
Value of output and income							
16.	Output (kg) (1000 x 0.6 x 0.4)	240	240	240	240	240	240
17.	Value of output (₹ 120 x 240)	28800	28800	28800	28800	28800	28800
18.	Own Funds (construction and input)	13899	7174	7174	9799	9799	9799
19.	Interest on own funds (10%)	1390	717	717	980	980	980
20.	Pond Depreciation (5%)	3585	3580	3580	3580	3580	3580
21.	Equipment Depreciation	1000	1000	1000	1000	1000	1000
22.	Loan repayment at 7%	0	7200	6806	6412	6019	-
23.	Total Cost to the Farmer (18 to 22)	19874	22296	21902	21771	21378	15359
24.	**Net income (17 minus 23)**	**8926**	**9129**	**9523**	**7029**	**7422**	**13441**

* Total cost comes to ₹ 90399/- when second year and third year feed cost are also added and loan is worked out on that basis. From the 4th year onwards, the farmer will be able to pay for the feed.

12.2 Economic Analysis of the Individual Pond Scheme

While income transfers are justified to remove poverty among the beneficiaries, the project must be economically viable from the point of view of society because investment is coming from public funds. Economic analysis is generally conducted either to rank the projects competing for limited funds or to calculate economic viability of a particular scheme. As there are no competing projects in this case, the analysis is restricted to the examination of economic viability. The analysis, popularly known as Social Benefit Cost Analysis (SBCA), is attempted here.

1. Social Benefit Cost Analysis

The computation of many components of benefits and costs is obvious, but there are some aspects for which intuition fails to suggest methods of measurement. There are two basic principles in this analysis. The first principle is that all aspects of the project, positive or negative, must be expressed in terms of money. The second principle is that the benefits and costs of a project have to be expressed in rupees of a particular time. A rupee available now is worthwhile more than a rupee obtained after sometime because it can earn interest. In order to make the returns of all the times comparable, benefits and costs of a project have to be converted to the present value by using a discount factor.

The analysis adopts various decision criteria to select or reject a project. These criteria are of two types – undiscounted and discounted measures. Pay-back period is the most important one among undiscounted measures. It gives the number of years in which the investment is recovered. This measure is useful for businesses with rapidly changing technologies. Because of the risk involved in the investment, the investor always tries to recover the investment at the earliest.

For projects with benefits extending for a longer period, there are four discounted measures namely, the net present value, the internal rate of return, the net benefit-investment ratio and the benefit - cost ratio. The net present value is the present value of the benefits net of all costs including capital cost. The incremental net benefits (total benefits-total cost) of each year will be discounted and aggregated. The internal rate of return is the rate which equates present value of incremental benefits to present value of incremental costs. The net benefit-investment ratio is the ratio of the aggregate of discounted incremental positive net benefits to the aggregate of discounted incremental negative net benefits. In these three measures, discounting process is applied to the net benefits rather than to benefits and costs separately. Net benefit is the difference between benefit and cost. The benefit-cost ratio is the ratio of aggregate of discounted incremental benefit to the aggregate of discounted incremental cost. In this measure discounting is done separately to benefits and costs.

In economic analysis, efficiency prices or shadow prices which reflect the real value of the resources have to be used. However, there is no need of using shadow prices in the present context because there are no subsidies or taxes distorting the materials used in the process of construction or production.

The discount rate in economic analysis should reflect the opportunity cost of capital. In most developing countries, it is assumed to be somewhere between 8 and 15 per cent and a common choice is 12 per cent. Besides opportunity cost, another discount rate frequently used is the social time preference rate. As the society has long time horizon, its discount rate is lower. Hence, the discount rate used is 10 per cent so that it will reflect both opportunity cost of capital as well as social time preference rate.

We have calculated the gross benefits in each year of the life of the project and deducted the capital cost and cost of inputs like lime, dung, fertilizer, fingerlings, feed, health measures, human labour and equipment. The residual, called net benefits, is available to recover the investment made in the project and to compensate for the use of the resources invested in the project. By deducting the 'without project net benefit' stream from the benefit stream of the project, we get the incremental net benefit stream. Since the land used for the construction of fish ponds is not under productive use, we assume that benefit stream without project is zero and hence there is no distinction between net benefit stream and incremental net benefit stream.

The net benefit stream includes both return of capital and return to capital. We do not deduct depreciation because the incremental net benefit stream already allows for the return of capital over the life of the project. We do not deduct interest on the capital because the result is the allowance for the return to the capital.

The data used for the calculation of various measures are shown in Table 12.2. Net present worth of the individual pond scheme is computed at 10% discount rate. The basic assumption of the analysis is that the life of the pond is 20 years and equipment like nets and other implements have to be replaced once in three years. In other words, the cost of equipment will be ₹ 1000/- lakhs every year. The cost of implementation is assumed to be 5 per cent of the total cost and it will be incurred in the first year. Though the performance of the farmers will be monitored in subsequent years also, the cost of this is not shown separately because it will be done for five years along with the implementation of the scheme in the other years.

Table 12.2: Net Present Value of Individual Pond Scheme at 10% Discount Rate

(₹ Lakhs)

Year	Incremental Cost					Incremental Benefit	Incremental Net Benefit	Discount Factor at 10%	Net Present Value
	Capital	Production Cost	Equipment & Capacity Building	Management Cost	Total Cost				
1.	71700	11649	2000	4267	89616	-	-89616	1	-89616
2.	-	11649	1000	-	12649	28800	16151	0.909090	14683
3.	-	11649	1000	-	12649	28800	16151	0.826446	13348
4.	-	11649	1000	-	12649	28800	16151	0.751315	12134
5.	-	11649	1000	-	12649	28800	16151	0.683013	11031
6.	-	11649	1000	-	12649	28800	16151	0.620921	10029
7.	-	11649	1000	-	12649	28800	16151	0.564474	9117
8.	-	11649	1000	-	12649	28800	16151	0.513158	8288
9.	-	11649	1000	-	12649	28800	16151	0.466507	7535
10.	-	11649	1000	-	12649	28800	16151	0.424098	6850
11.	-	11649	1000	-	12649	28800	16151	0.385543	6227
12.	-	11649	1000	-	12649	28800	16151	0.350494	5661
13.	-	11649	1000	-	12649	28800	16151	0.318631	5146
14.	-	11649	1000	-	12649	28800	16151	0.289664	4678
15.	-	11649	1000	-	12649	28800	16151	0.263331	4253
16.	-	11649	1000	-	12649	28800	16151	0.239392	3866
17.	-	11649	1000	-	12649	28800	16151	0.217629	3515
18.	-	11649	1000	-	12649	28800	16151	0.197845	3195
19.	-	11649	1000	-	12649	28800	16151	0.179859	2905
20.	-	11649	1000	-	12649	28800	16151	0.163508	2641
									45486

The estimated values of the four measures are shown in Table 12.3. Considering the fact that total investment is ₹ 89616/- and annual recovery is ₹ 16151/-, it takes 5.5 years to recover the entire cost. In other words, the pay-back period is 5.5 years. There is, however, no problem of this investment becoming obsolete. Hence we go for the discounted measures to understand the return to the capital invested.

The first measure, net present worth of the scheme, is estimated at ₹ 454.86 crores. With a total investment of ₹ 896.16 crores, an additional income of ₹ 454.86 crores is generated in 20 years after recovering the original investment.

A second measure is internal rate of return which is estimated at 17.13 percent. This is much higher than the rate of return we can expect for any project intended to alleviate poverty.

The net benefit-investment ratio is 1.508 and indicates that benefit is higher than investment by 50.8 per cent. Benefit-cost ratio is estimated at 1.2328 which means that the present value of aggregate benefit is 23.28 per cent higher than the cost. Generally, a project is recommended if the ratio is higher than 1.1 if it serves other goals like reducing inequalities in income distribution and employment generation. Thus all the four measures of project appraisal indicate that the individual pond scheme has high value.

2. Impact on Employment

The impact of the scheme on employment generation is also important because agriculture in the State cannot provide employment throughout the year. The project generates two types of employment – employment created in the construction of the pond which is a onetime event and annual employment created in fish production. The former is highly significant, while the latter is important. The investment is labour intensive because digging of the pond will be done only by labour and material component is quite negligible. This programme can easily be converged with MGNREGS since labour component accounts for a large per cent of the total cost.

Construction of pond generates 600 person days of employment which can be treated as employment for six families as per the MGNREGS norm of 100 days of employment per family in a year. The Mission envisages construction of 20000 fish ponds per year indicating that 1.2 lakh households get employment for 100 days each. The State has a population of about 30 lakhs or six lakh households. Assuming that four lakh households need employment under MGNREGS, the programme can create employment for 30% of the households seeking employment under MGNREGS. Since the programme runs for five years, near about 30% employment needs under the MGNREGS in the Twelfth Plan can be taken care.

Employment is also generated in the production process of fish for 12 days per fish pond in a year. This low employment in production is a desirable feature because it indicates high productivity of labour. The value of output produced per day is very high at ₹ 2400/-. Thus,

the scheme generates highly productive employment. Thus, the two positive features of the programme are highly labour intensive capital formation and high labour productivity in a production activity.

The scheme has high impact on income distribution because it is providing supplementary income without taking away much of their time. Since average income of beneficiary households is less than that of the others, inequalities in income distribution will be reduced by the project. The actual gain is more than what is reflected in the net present value.

12.3 Sensitivity Analysis

Many investment projects contain elements of uncertainty in which case the predictions of the cost-benefit analysis may go wrong. These uncertainties arise due to several factors like price changes, natural calamities etc. In order to understand the range of variation in the returns, sensitivity analysis is suggested.

In the present analysis three types of relaxations are made – the life of the fish pond is brought down to 15 years instead of 20 years, the cost of production is increased by 10% or both cost of production as well as the increase in the production are taken at 10%.

The four measures are computed with these changed assumptions and the results are shown in Table 12.3. When the life of the pond is reduced to 15 years, the net present worth of the project declines to ₹ 293.63 crores. That is a decline by 35.4%. Even after this decline, the project is economically viable. Internal rate of return declines to 15.67 from 17.13% and the benefit-cost ratio declines to 1.16 from 1.23. The net benefit-investment ratio declines to 1.328 from 1.508. All the ratios change significantly, but the project is still viable. All these ratios are high even after decline and strongly support the investment.

Even if the cost of input increases by 10%, the decline in the ratios is only moderate and the project is still economically viable. Net present worth declines to ₹ 345.76 crores, a decline of 24.0%. The net benefit investment ratio declines to 1.38 from 1.51. These two measures are significantly higher than those obtained for the 15 year life of the pond. The other three ratios namely, internal rate of return and benefit-cost ratio, decline significantly and come close to the values obtained for the 15 year life of the project. Thus, an increase in the cost of inputs by 10% is will not change the decision rule and the situation is better than the situation of decline in the life of the project to 15 years.

The adverse effect of 10% increase in the cost is must less than that of the decline in the life of the project. The net present value is high at 345.76 crores and net-benefit investment ratio is 1.38. The other two ratios are close to the situation of 15 year project life.

It is important to recognize that there is scope to increase productivity along with increase in cost of production because the present rate of mortality of the fingerlings is high. We assume that production increases by 10% along with increase in cost by 10%. The net present worth

rises to ₹ 586.67 crores, an increase of 29.0 per cent from the original scenario. The net benefit-investment ratio rises to 1.64 from 1.51. Internal rate of return rises by two percentage points and reaches 19.0 per cent. The benefit cost ratio rises steeply to 1.28. It should be noted that the fourth scenario is more likely and the project is likely to pay dividends much beyond the initial expectations.

Table 12.3: Sensitivity of Measures of Project Effectiveness

S. No.	Measure	Original Scenario	Life of Pond reduced to 15 Years	10% Increase in Cost of Production	10% Increase in Cost and Output
1.	Net Present Worth (₹ crores)	454.86	293.63	345.76	586.67
2.	Net-Benefit Investment Ratio	1.508	1.328	1.3809	1.6462
3.	Internal Rate of Return (%)	17.13	15.676	15.43	18.95
4.	Benefit-Cost Ratio	1.2328	1.1606	1.1676	1.2843

12.4 Summary and Conclusions

Construction of individual fish ponds, the main component of the MSAM, has two objectives – expansion of fish production and reduction of poverty. Expansion of production has to be achieved along with economic viability for judging which cost-benefit analysis is the appropriate tool. Poverty reduction would be possible if the scheme focusses on the poor and adequate income and employment gains are accruing to the poor.

The scheme is made self-targeting by restricting the size of the pond to 0.1 hectare. Since the beneficiaries are poor, a lot of financial support, both direct and indirect, is provided. Out of the total cost of ₹ 90000/-, the Government of Meghalaya provides direct assistance to the extent of ₹ 54000/- and arranges loan for ₹ 22500/- at a reasonable rate of interest.

Net income derived by the farmer in the first year is estimated at ₹ 8926/-. Annual income varies between ₹ 6241/- and ₹ 7422/- between second year to fifth year because of the repayment of the bank loan. The loan will be completely repaid in the fifth year and annual income rises to ₹ 13441/- from sixth year onwards. The actual increase in income will be more than the estimates provided here because the mortality of the fingerlings is expected to come down with the supply of quality fingerlings and interventions in health. It is possible to reduce mortality to 20 per cent in which case output increases by another 80 kg and income by another ₹ 9600/-. Thus, supply of good quality fingerlings and provision of health care are crucial for greater impact of the scheme on poverty. The calculation of income is made at the prices of 2011. If prices of inputs and outputs rise in the same proportion, the absolute income of the farmer increases. The scheme provides a reasonable supplementary source of

income to the marginal and small farmers. All the households whose income falls short of the poverty line by a quarter or less will be lifted above poverty line.

Net present worth of the individual pond scheme is computed at 10 per cent discount rate. The basic assumption of the analysis is that the life of the pond is 20 years and equipment like nets and other implements have to be replaced once in three years. In other words, the cost of equipment will be ₹ 1000 lakhs every year. The cost of implementation is assumed to be 5 per cent of the total cost and it will be incurred in the first year. Though the performance of the farmers will be monitored in subsequent years also, the cost of this is not shown separately because it will be done for five years along with the implementation of the scheme in other years.

The economic analysis reveals that the scheme is viable and provides good returns. The investment will be recovered in 5.5 years. The discounted measures strongly support the scheme. An investment of ₹ 896.16 crore is generating an additional income of ₹ 454.86 crore in 20 years after recovering the investment. The internal rate of return is estimated at 17.13 per cent which is higher than the rate of return expected from any project intended to alleviate poverty.

The scheme will provide employment in the construction of the pond for 1.2 lakh households at the rate of 100 days for each which implies that the scheme can create employment for 30% of the households seeking employment under MGNREGS in the Twelfth Plan period. The employment generated in the culture of fish is not much but it is highly productive. The value of output produced per day is ₹ 2400/-.

The scheme has high impact on income distribution because it is providing supplementary income to the people without taking away much of their time. Since average income of beneficiary households is less than that of the others, inequalities in income distribution will be reduced by the project. The actual gain is more than what is reflected in the net present value.

The economic viability of the scheme is established even after allowing for uncertainties. When the life of the pond is reduced to 15 years, the net present worth of the project declines to ₹ 293.63 crore and the return to the investment is still high. Internal rate of return declines to 15.67 from 17.13 per cent and he benefit-cost ratio to 1.16 from 1.23. All these ratios are high even after decline and strongly support the investment.

If the cost of input increases by 10 per cent, the decline in the ratios is only moderate and the returns higher than in the case of decline in the project life.

The most realistic situation is increase in cost of production as well as productivity as the mortality of the fingerlings is expected to come down with the interventions. If both cost of production and productivity rise by 10 per cent, the net present scheme rises to ₹ 586.67

crores, an increase of 29% from the original scenario. The net benefit-investment ratio rises to 1.64 from 1.51. Internal rate of return rises by two percentage points and reaches 19.0 per cent. The benefit cost ratio rises steeply to 1.28. Thus the scheme which is an important component of the Mission has strong fundamentals and it is one of the rare interventions with equal emphasis on growth and poverty eradication.

Chapter XIII

Implementation Process and Mechanism

Strengthening of Institutions

Institutions play an important role in the economic development of a state. The Mission needs support from two institutions namely, Fish Farmer Development Agency (FFDA) and Fishery Co-operative Societies (FCS) and the civil society organizations. The former is the executing agency and the latter is the people's institution for galvanizing the farmers in marketing of inputs and output.

13.1 Fish Farmers' Development Agency (FFDA)

The Fish Farmers' Development Agency is an autonomous body created for the implementation of the Mission. The Minister (i/c. Fisheries) is the Chairman of the Agency. It will have a two-tier system of organisational structure, one at the State level and other at the district level. The Director, Fisheries is the Chief Executive Officer (CEO) at the State level and the CEO is assisted by a Deputy Chief Executive Officer (DyCEO) in all technical as well as administrative matters.

At the District level, the Superintendent of Fisheries will function as the District Executive Officers (DEO) of the FFDA, who will be responsible for the implementation of the programmes of the Mission. Two levels of contractual employees will assist the DEO in addition to the Fishery Department's officers viz., the Sub-divisional Fishery Officers, Fishery Demonstrators, etc. The Programme Managers (PM), recruited on a contract basis from B.F.Sc/B.Sc. (Pisciculture) graduates will assist the DEOs in implementing and monitoring the State Aquaculture Mission. The second cadre is the Multiple Service Providers (MSP). They will be selected from candidates with Class XII qualification. They will be used for reaching out to the farmers. They will be imparted the necessary training by the FFDA. There will be six MSPs per district and hence, a total number of 42 MSPs will be recruited in the State during the period of the Mission. Their appointments are purely contractual and co terminus with the Mission.

13.2 Functions of the officials of the FFDA:

a) CEO:

1. The CEO, FFDA will convene all meetings of the Agency in consultation with the Chairman (FFDA) and Commissioner & Secretary/Principal Secretary (Fisheries).
2. Implement, supervise and monitor the Aquaculture Mission in the state as per the Mission document.
3. Comply with the directions and advice as may be given by the Governing body and Executive Committee of the FFDA from time to time.

4. These roles will be in addition to the duties entrusted to the CEO of the FFDA, in the normal course of his duties.

b) Deputy CEO:

1. Will assist the Mission Director-cum-CEO in all administrative as well as technical matters.
2. Will be responsible for the monitoring of the implementation of the Mission.
3. Will assist in the organization of the workshops, public meetings, awareness campaigns, training programmes, etc.
4. Will be responsible for the publication of technical training manuals, booklets, annual progress reports etc.
5. Will be responsible for the implementation of the MIS.
6. Any other matter entrusted to him from time to time by the Government and or the FFDA.

c) District Executive Officers (Supdts of Fisheries) & Sub-divisional Executive Officers (Fishery Officers):

1. In addition to their normal duties of functioning within the budgets provided to them under the SPA, State Plan, etc. the DEOs of the FFDA and the Sub-divisional E.Os. are directly responsible for the implementation of the Aquaculture Mission in letter and spirit. They are the kingpins in the implementation of the Mission's mandate scrupulously and diligently.
2. From the stage of the Mobilization till the completion of the projects, the role to be played by the DEOs and Sub-divisional EOs will be that of enrolment, liaising with the MCAB for credit transfers, execution, supervision, and record keeping as well as financial transfers, as per the legal and financial frameworks that are already in vogue, or to be prescribed, as the case may be from time to time.
3. They are fully responsible for organizing the prompt MIS data transfer as also the subsequent facilitation of the field monitoring and evaluation by the internal and external teams, as the case may be.

d) Programme Managers:

1. Will help in the finalization of the preparatory phase comprising of formulation of draft project proposals, data collection, holding of seminars/workshops/meetings, interaction with experts, compiling of information, etc.
2. Will assist in the identification and documentation of the existing large water bodies in the state.
3. Will assist in the identification the potential rivers, streams, for creation of multi-species sanctuaries, sport fisheries, etc.

4. Will impart technical training to all the beneficiaries assisted under the "Meghalaya State Aquaculture Mission".
5. Will monitor the implementation of the Mission.
6. Will assist the FFDA in the data management and other official works.
7. Will document the processes from inception to completion and assist in the MIS.
8. Will monitor construction, pre-stocking, post stocking management of the pond.
9. Will assess the growth and health of fish on a regular basis.
10. Will observe harvesting and assess production, marketing and help in post harvest management.
11. Any other duties as may be assigned to them from time to time.

e) Multiple Service Providers (MSPs):

1. They will be utilised in providing various door-step delivery services to the farmers, so as to ensure timely access to seed, feed and management services.
2. They will visit all the fish ponds under their jurisdiction, study the water conditions and assist the farmers to tackle any unstable conditions of the water there and then.
3. They will also assist the farmers in trial netting, harvesting, marketing of fish, etc.

13.3 Fishery Co-Operative Societies

The major focus of the mission is on the poor who cannot procure the necessary inputs and sell the output on their own. If the farmers get together and form a society, they can conduct the business enterprise more efficiently. Many of the interventions of the Mission can be implemented through the co-operatives. The activities that can be entrusted to the co-operatives are: (a) Creation of co-operative fish ponds (b) supply of portable FRP hatcheries (c) management of fish feed mills (d) marketing processing of fish (e) capacity building of the farmers.

There are a large number of fishery co-operatives which are in a dormant stage due to lack of activities. Since the Mission is introducing area expansion on a large scale along with infrastructure development, technology induction and capacity building of the fish farmers, some of these activities can be entrusted to the co-operative sector and it becomes viable and vibrant. In order to strengthen the cooperatives the functional support will be provided, not the general purpose support. Societies with negative net work (cumulative lossess exceeding its own fund) will not be eligible for such assistance. For availing assistance for pond construction, the society must have a minimum lease period of ten years. For cooperatives with good track record assistance would provided for (a) creation of cooperative fish ponds (b) supply of portable FRP hatcheries(c) fish processing (d) technology induction (e) capacity building. A tentative allocation of funds for cooperative societies is shown in Table 4.15. The

total allocation for the cooperatives is ₹ 400 lakh. The amount can be allocated after identifying the societies that can be involved in the activity.

Table 4.16: Physical Targets and Expenditure for Strengthening Fishery Co-operatives

Item		**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**Total**
Ponds	Units	5	5	5	5	5	25
	Assistance	15.0	15.0	15.0	15.0	15.0	75.0
	Own	10.0	10.0	10.0	10.0	10.0	50.0
	Total	**25.0**	**25.0**	**25.0**	**25.0**	**25.0**	**125.0**
FRP Hatcheries	Units	2	2	2	2	2	10
	Assistance	1.398	1.398	1.398	1.398	1.398	6.99
	Own	0.932	0.932	0.932	0.932	0.932	4.66
	Total	**2.33**	**2.33**	**2.33**	**2.33**	**2.33**	**11.65**
Processing Units	Units	-	-	-	1	1	2
	Assistance	-	-	-	4.2	22.20	26.40
	Own	-	-	-	2.80	14.80	17.6
	Total	**-**	**-**	**-**	**7.0**	**37.0**	**44.0**
Technology Induction	Units	2	2	2	2	2	10
	Assistance	24.0	24.0	24.0	24.0	24.0	120.0
	Own	16.0	16.0	16.0	16.0	16.0	80.0
	Total	**40.0**	**40.0**	**40.0**	**40.0**	**40.0**	**200.0**
Ornamental Fishes	Units	-	2	2	-	-	4
	Assistance	-	0.96	0.96	-	-	1.92
	Own		0.64	0.64			1.28
	Total	**-**	**1.60**	**1.60**	**-**	**-**	**3.20**

Chapter XIV

Engaging the Civil Society in the Aquaculture Mission

Civil Society in all its shades of meaning, has of late, come to occupy an important role in both steering the public discourse as also setting the agenda for the country. In the context of development being viewed in terms of fundamental humanistic values and people-centred activity, rather than narrowly techno-economic in nature, civil society has a vital role to play. On occasion, it also has taken upon itself the responsibility to discharge some of the government's programme delivery functions both within the framework of the organized governmental effort and at times, independent of it. In this respect, civil society can be effectively used to mobilize and educate the mass, while government institutions can provide technical support and services. The point to be noted here is that there is some value unlocking that takes place for the broader community with the active involvement of the civil society and its engagement in the Aquaculture Mission can only help serve the interests of the people of the state.

The approach of the Mission to engage the civil society players would therefore, have to be appropriate both in terms of the selection of the like-minded organizations as well as in the identification of the activities that are likely to facilitate maximum participation of the people and the community. The bridge that would be laid by the civil society with the broader community would have to have the net effect of enhancing the awareness levels, improving the quality of the delivery, eventually to lead to a better, more knowledgeable, and more sensitive society that will further the objectives espoused by the Aquaculture mission better. The process of adoption of technologies does not always get initiated spontaneously, and the services of a facilitator may be required to catalyse the process. Civil society can take the role of facilitating the public to become active partners of the Mission.

That said, it would need to be also noted here that the quality of delivery of any determined activity would depend upon the design of the activity as also the quality of the implementing protagonist. In a state like Meghalaya, there is as much a need for enhancing the quality and the competence of the civil society players as that of the government officials. Admittedly, an oft-neglected component of any government programmes is in not engaging the civil society at all, to begin with, followed by an improper selection of under qualified or incompetent civil society organizations, leading eventually to failures. Further, there is little effort to enhance the competencies of the civil society players. So, one of the components that would need addressing is the capacity building of the civil society players itself which, by definition will be a long-drawn effort, but whose pay-back would sustain over a long period, with greater dividends forthcoming in an intangible manner. This is an investment that the government will make under the Mission. In this way, the Mission is trying to make the civil society function as effective animators. The role of animation by the civil society is to assist the public to investigate, critically reflect on and

analyze the social reality on their own, and provide intellectual capacities and a knowledge base to think and act creatively to transform their realities.

Several meaningful interventions have been envisaged for the civil society in terms of the specific activities that would be broadly under the umbrella of mass awareness, mass mobilization, specific campaigns for the conservation of the native and endemic species of the state and social audit of the implementation of the Mission. Working out the best intervention for the best organization would be a very sophisticated exercise, to be done with great diligence and care, so as to ensure the best fit for the specific tasks envisaged.

An effort would be made to shortlist organizations that evince interest in pursuing the specific activities identified under the Mission. Based on certain objective parameters, organizations would be identified for specific interventions. Some of the important parameters would be –

a) Credibility of the organization as evident from the press reports, public opinion, web site, etc
b) Catalytic interventions of the organisation related to mobilization and awareness creation
c) Activities related to initiating/strengthening people's organisations undertaken by the organisation
d) Networks/coalitions established by the organisation with other reputed agencies
e) Previous experience of working with government departments and government schemes.

The costs would be worked out and it is expected that the civil society also contributes in terms of its manpower and other resources for undertaking the activities. By its very nature, the Civil Society's interventions would evolve over time within the broad framework of the Mission and it would be difficult to envisage the entire budgetary requirement for this chapter. So, it is felt that an overall corpus of about ₹ 10.00 crores be earmarked for this chapter to be spent over a period of five years averaging an investment of about ₹ 2.00 crores a year.

The specific activities to be undertaken under this Chapter would be as below:

1. Periodic Workshops with the civil society on specific themes of the MSAM with an intention to sensitize them as also to build their capacities.
2. Creating a pool of Animators, Facilitators and Master Trainers within the civil society to engage them in the Mass Mobilization and Mass Awareness campaigns.
3. Incentivizing the best performing civil society organizations based on an objective assessment of their performance, annually.
4. Providing a range of services to the partners of the Mission by way of better information on seed, feed, disease management, marketing, value addition, etc.
5. Assisting in the institutional building process of the Mission, ranging from raising awareness among the public about opportunities, to empowering them and strengthening of the mission through linkages.

6. Furthering the concept of Matsya Mitras as done in other parts of the country, with an intent to create a cadre of people who would want to contribute to the growth of the Fisheries sector in the state.
7. Likewise, to constitute the River Defence Parties to protect the rivers from wanton exploitation of natural resources in the rivers as also protecting the aquatic fauna from poisoning, dynamiting, over exploitation, etc.
8. Any other activity that will further the objectives of the Mission by enabling participation the civil society.

To conclude, the above list of activities is only to give a broad indication of the intent of the government to engage the civil society in a meaningful, sustainable and productive manner for the overall growth of the fisheries sector in the state. By no means, can the above indication be deemed as exhaustive and complete. It will evolve over the years, as the experience and the understanding of the range of issues expand in the state, while the competencies of both the government officials and civil society players will increase. However, for the effective implementation of the Mission, engaging the civil society in the various activities of the Mission is considered to be right step in the right direction.

Chapter XV

Sourcing of the funds and assistance management under the Mission

The total investment for implementing the various components of the Mission has been tentatively worked out to ₹ 1138.645 crores, out of which the funds required from the Government/Agencies of the Government in the form of assistance would be ₹ 795.328 crores.

It is expected that a substantial share could be mobilized from different sources such as RKVY under the Ministry of Agriculture, NFDB, NEC, NCDC, SPA, State Plans and various schemes under the Central ministries. However, it may not be possible to visualize or arrive at the exact quantum of funds that could be mobilized at this stage.

For the implementation of the Mission, institutional credit support through the Meghalaya Co-operative Bank will be sought. Similarly, possible funding through other multi-lateral institutions also will be explored.

Periodical reviews will be made to estimate the total fund requirement and its deployment for the implementation of the Mission and the sourcing of funds will be updated accordingly.

TENTATIVE ASSESSMENT OF REQUIREMENT OF THE FUNDS

(₹ Crores)

Components	Total investment required for 5 years (2012–17)	Assistance	Funding							
			NFDB	Central Government	State Government (Plan)	RKVY	SPA	NEC	NCDC	MPEDA
Mini Mission – I: Area & Productivity Expansion	933.74	561.34								
Mini Mission – II: Critical Infrastructure Development	71.02	62.23								
Mini Mission – III: Establishing sanctuaries for conserving indigenous & endemic species	13.005	13.005								
Mini Mission – IV: Capacity building & Human Resource Development	20.55	20.55								
Mini Mission – VII: Mass Media Campaign, Documentation & Outreach	10.30	10.30								
Mini Mission – VI: Emerging opportunities in the Fisheries Sector	26.43	26.43								
Convergence corpus Fund	50.00	50.00								
MIS & Knowledge Management	2.60	2.60								
Monitoring & Evaluation	1.00	1.00								
Engaging the Civil Society in the Aquaculture Mission	10.00	10.00								
Total Project Cost	**1138.645**	**757.455**								
Administrative Cost at 5% of the Total Project Cost		37.873								
GRAND TOTAL	**1138.645**	**795.328**								

End Notes and Acknowledgements by Shri K.N. Kumar, IAS, Principal Secretary, Fisheries

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'The cat would eate fishe, but would not wet her feete', so said the Lady Macbeth, the Shakespearean character, of her husband. To wish for something but be unwilling to invest or risk anything, to attain that goal, is somewhat akin to window shopping. People who want to eat fish must do something – first to learn the art of producing them and then, to generate wealth out of them.

Visualizing a fish production of nearly 15000 M.Ts. in five years time! Pragmatists would squirm. Quite clearly, there are pitfalls in embarking upon a journey as big as this. But public service is much more than just treading the path of least resistance, or picking up the easiest of the options. The biggest threat for a Mission such as this would be the tendency of the human mind to think sub-optimally and pitching safety and security at premium over risk and hope. Thinking big - even if it does not come so very easily is the only way forward and one shouldn't be faulted for thinking that for it to be called life, it ought to be more than mere existence.

The first success of the Department of Fisheries is in the production of this actionable document which captures the desire to achieve things that had, in the past neither been envisaged nor attempted. The preparation of this document itself had been a major capacity building exercise, a massive consultative effort, partly to energize a somewhat somnolent system, and in part, to let a small beacon of hope penetrate our near comatose domain of Fisheries. Intangible it may have been, but it looks like it has worked. The pride with which my officers conduct themselves now is an indicator of the changing winds. I count small successes, for they pave the way for large victories.

One can't claim that it is a perfect document. If perfection is God, then atheists of my kind would be happy to proclaim that both do not exist. We will learn more, as we move along, we will make mid-course corrections as we start implementing; but we will persevere. Five years down the line, the fish on the dining tables of Meghalaya will not be produced some 2000 K.M.s away nor would they have travelled for 15 days prior to reaching them. We seek every one's involvement in putting the state on a path from where there is neither looking back, nor turning back! The world that we live in, may not give much hope for the optimists, but cynicism is no option either. So we decide to march on!

A document of this kind cannot be the work of one person or even just a team of a few officials. The idea of a Mission for fresh water fish had spawned, sometime in May, 2011. It started off with a discussion paper to start with. Based on the inputs received from various stakeholders, a draft Mission document was published in August, 2011. It took nearly three months of elaborate discussions with several stakeholders and the comments received from farmers and experts helped us finalize the document. Dr. Subrahmanyam, Dr. R.M. Prasad and Dr. R.P.Singh, Advisers to the Basin Development Authority have helped us in bringing in the academic rigour to the document.

A Committee of the Senior Officers of the Department of Fisheries had been set up that gave us a series of suggestions on various chapters that helped us refine the document further. We have received comments and suggestions from various research institutions, central and state government officials on the Discussion Paper as well as the Draft Mission document. Most of the inputs have been incorporated.

I have received several ideas from the various workshops and consultations with the Bankers, with the cooperators, with the scientists, the MRDS and NERCOMP officials. Their ideas appear in the document in various forms. The CEO of the NFDB, Dr.P.Krishnayya, the Directors of the CIFA and CIFRI, the DG of the Fishery Survey of India, the scientists of the ICAR, and the faculty of the Fisheries Department, St. Anthony's College, Shillong, have given their suggestions at various times. The only touchstone for the inclusion or otherwise of a suggestion is its implementability.

I will make a special mention of Shri A.F.Syiem, Dy.CEO.FFDA, who lightened my load at different stages of the preparation of the document, not just with the inputs, but also with his timely wit and humour. Humour, apparently is not yet lost, in administration!

On behalf of the department's officers I would like to place on record our deep sense of gratitude to the Hon'ble Chief Minister (i/c.Fisheries) Dr. Mukul Sangma, for the unstinting support we received from him at every stage.

K.N.Kumar, IAS
Principal Secretary
Department of Fisheries

Fish Pond at Phot-Ja-Ud, Mawkyrwat, West Khasi Hills