



# MATSYA SAMPADA

Newsletter

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Department of Fisheries  
Ministry of Fisheries, Animal Husbandry & Dairying  
Government of India



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# Messages



## Shri Giriraj Singh

Hon'ble Minister, Ministry of Fisheries,  
Animal Husbandry & Dairying

It gives me immense pleasure to launch the second edition of the Newsletter 'Matsya Sampada' brought out by the Department of Fisheries under my Ministry. The Newsletter would help stakeholders stay up-to-date with the latest information on government policies and programmes, upcoming events and progress of projects related to fisheries sector.

Recently, our government under the leadership of Honorable Prime Minister Shri Narendra Modi ji has launched a new Flagship Scheme i.e. the Pradhan Mantri Matsya Sampada Yojana (PMMSY) at an investment of Rs.20,050 crore for holistic development of fisheries sector in the country. Being the largest ever investment in fisheries sector, the PMMSY envisages an additional 70 lakh tons fish production, Rupees one lakh crores fisheries exports, generation of 55 lakh employment over next five years, etc.

Achieving the ambitious targets under PMMSY require enhancement of production and productivity, technology infusion, quality seed and feed, species diversification, etc. along with a collaborative and concerted efforts between the government and the stakeholders. All these endeavours call for an effective platform to quickly reach out to the stakeholders in disseminating new technologies, governmental policies and programmes and the Newsletter 'Matsya Sampada' is a step in the right direction.

I am confident, it would serve as one of the important medium for disseminating information among the stakeholders especially fishers, fish farmers, youth and entrepreneurs across the country. I extend my compliments to Dr. Rajeev Ranjan, IAS, Secretary (Fisheries), Department of Fisheries for bringing out the second edition of 'Matsya Sampada' in a short span of time. I take this opportunity to extend my best wishes to all stakeholders and readers.



## Shri Pratap Chandra Sarangi

Hon'ble Minister of State, Ministry of Fisheries,  
Animal Husbandry & Dairying

I am happy to inform that the Department of Fisheries is bringing out the second edition of Newsletter 'Matsya Sampada'.

The launch of this Newsletter is timely and much needed to communicate the governmental policies and programmes in fisheries sector including the good works being done both by government as well as the private sector.

Fish is an important source of food and affordable nutrition especially to the coastal communities in our country. India with its vast fisheries resources both marine and inland offers immense opportunities for growth and development of the sector. The huge

untapped potential for capture and culture fisheries can be optimally harnessed by policy and financial support. Towards this end, our government has recently launched the flagship scheme Pradhan Mantri Matsya Sampada Yojana (PMMSY) for sustainable and responsible development of fisheries sector. I am confident that the Newsletter would also help in publicizing the various initiatives under PMMSY.

I am sure that the Newsletter will prove to be a wonderful platform of communication to all stakeholders. On this occasion, I would like to extend my appreciation to Dr. Rajeev Ranjan, IAS, Secretary (Fisheries) and his team for this initiative.





### Dr. Rajeev Ranjan, IAS

Secretary, Department of Fisheries,  
Ministry of Fisheries, Animal Husbandry & Dairying

It gives me immense pleasure to introduce the second edition of the Newsletter, 'Matsya Sampada' published by the Department of Fisheries. The Newsletter is an outcome of our endeavour to inform and educate stakeholders about the latest policies, programmes and initiatives of the government of India with regard to the sunrise fisheries sector.

'Matsya Sampada' is being published at a time when the Government of India has launched the Pradhan Mantri Matsya Sampada Yojana (PMMSY) at an investment of Rs.20,050 crore for the sustainable and responsible development of the fisheries sector in

the country. The investment under PMMSY is the highest ever in the fisheries sector and by far for the most important moment in the journey of the fisheries development. With an array of fisheries value chain, the scheme is likely to take our fisheries sector to the next level.

I am confident that this Newsletter would serve as a useful platform for showcasing the best practices, latest development and success stories in the fisheries sector in general and under PMMSY in particular.

I congratulate our team and appreciate their efforts in publishing the Newsletter.

## From the Desk of Editorial Board

Welcome to the second edition of the Newsletter, 'Matsya Sampada' published by the Department of Fisheries. It is our constant endeavor to inform all stakeholders about the government policies and programs for the development of the fisheries sector in the country.

The fisheries sector is the fastest-growing one in India. It not only provides food and nutrition security but also gives employment and income to about 28 million people. The Government of India has given a fillip to the sector by announcing a new Flagship Scheme i.e. the Pradhan Mantri Matsya Sampada Yojana (PMMSY) at an investment of Rs. 20,050 crore. It requires a lot of efforts to achieve the ambitious goals set by Government. Thus, an effective medium is required to interact with

different stakeholders and highlight success stories across the country.

We believe that this Newsletter will be an authentic source of information about government policies and reforms in the fisheries sector. We disseminate useful information in a concise manner to our readers. Also, the inspiring stories of individual farmers, entrepreneurs, and FPOs will certainly create a positive impact.

We appreciate the valuable guidance and suggestions of Secretary (Fisheries) in the selection of contents of the newsletter. We also extend sincere thank to officers/officials of the department for the contribution in making the Newsletter. We are sure that the newsletter will be very useful to all our stakeholders.

# Aquaculture Potential in India



Aquaculture is the one of the major food production sectors of the world and during the last five decades, considerable effort has been made across continents to develop economically viable technologies to support its growth and increase livelihood opportunities. As per FAO (2020) the global aquaculture production was 82.1 million tonnes which is a commendable growth from an average production rate of 14.9 million tonnes annually during the period 1986-1995 decade. In 2018, this sector has provided full time, part-time or occasional job opportunities for about 20.5 million people and highest 85% was from Asia.

Considering the technological advancements made during the last two decades and the successes achieved in new technology adoption, it can be confidently stated that the potential for aquaculture development in the coastal and marine areas of the country is high. It is possible to make this sector as popular as agriculture, with even more profitability. A synchronised approach is required to achieve this task. The main aspects which can support this development are given below.

## Where to farm ? :

There is extensive spread of highly productive estuarine and coastal area in all the maritime states which are suitable for aquaculture. Of the potential 12.4 lakh ha only about 15% of the area has been used so far.

However, not all area can be utilized for all species. Through clear marking of potential farm sites at micro-level (Aquaculture zonation maps), area under aquaculture can be increased, without affecting other common resource users.

## What to farm? :

Research and development along with market acceptance has shown that it is possible to successfully farm carnivorous fishes (eg Cobia, Seabass, grouper, silver pompano and other species) as well as herbivorous fishes (eg mullet, milk fish and other species) in simple cages or in enclosed ponds. Apart from this, edible bivalves like mussels and oysters can be farmed from temporary farm structure in shallow areas using locally available farm material. In the nearshore areas where salinity will be stable, sea weed (*Kappaphycus alvarezii*) can be cultured. Potential for farming other species is also moderately high.

Crab fattening and farming can be done in mangrove and other suitable wet lands and abandoned shrimp ponds. Also potential for lobster fattening are high especially in Gujarat where small sized lobsters are available. This type of Capture based Aquaculture (CBA) is possible in the country for species whose seed production in hatcheries is not standardised.

## Potential for high value resources :

The potential to repeat the success of shrimp farming especially *Litopenaeus vannamei* is high. Even by farming

in just 1.5 lakh ha area, the country has been able to produce 6,73,579 tonnes of shrimp including *Penaeus monodon* and *L.vannamei*. The production was only 75997 tonnes in 2008-09. Apart from this, native species like *Penaeus indicus* can also be farmed.

### Potential for ornamental (aquaria) resource farming :

The marine aquaria trade is very lucrative and is steadily increasing. In India, there are several native species of damsels, clown fishes and other attractive ornamental fishes which can be easily bred and reared. Similarly brackish water fin-fishes which are ornamental can also be bred and traded. These can be developed in selected villages close to the sea.

### Potential for non-edible resources:

India has been the abode of oriental pearls. The pearl oysters in the pearl banks of Tamil Nadu and Gujarat can support pearl culture. Similarly the serene crystal clear waters of Andaman & Nicobar Islands can support the world famous black pearl industry. However, this needs a different approach and is capital intensive and need international collaboration.

### Manpower availability :

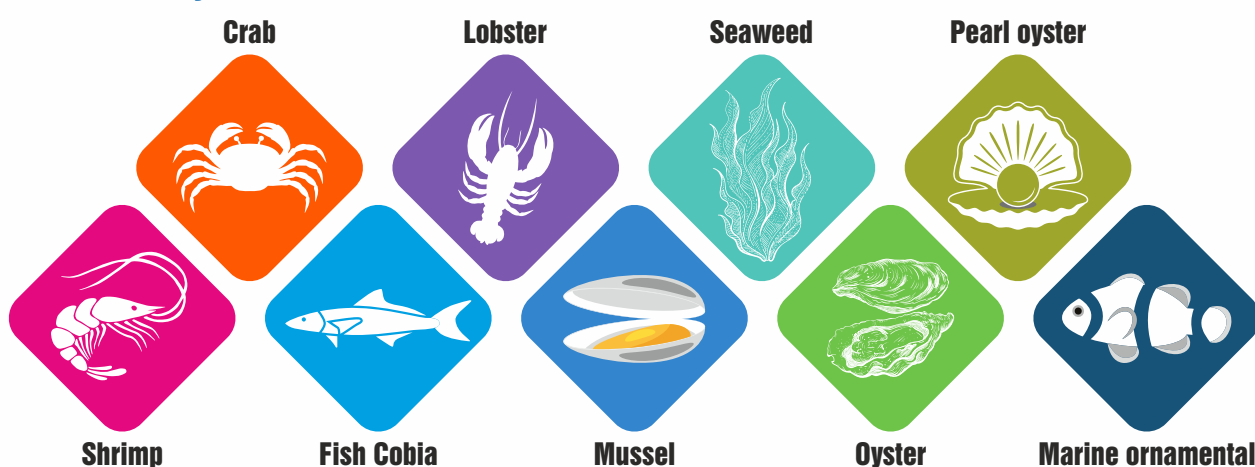


Figure showing diverse resources which can be farmed in Indian waters

Aquaculture is labour intensive. There will be no dearth of skilled/unskilled/ semiskilled manpower to take forward the aquaculture programs. The highly skilled manpower specialised in Aquaculture from the Fisheries Universities and other State level universities; the semiskilled manpower from the vocational higher Secondary Courses of different maritime states specializing in aquaculture and the trainees from Institutes under the MoF and other organizations will be able to successfully implement the programs related to all types of aquaculture. Moreover, part-time or occasional jobs will also be created which will be useful for unemployed youth, elders, and women (Fig 2).

### Seed Availability:

For most of the aquaculture programs mentioned here the technologies for seed production has been perfected. However upscaling has to be done and guidelines developed.

### Inputs like feed :

About 3543 certified products like Feed additive, Pro-biotics, Larval feed, Adult feed, Chemicals, Disinfectant, Immune-stimulants and Drugs are already available . This industry can scale up Indian Aquaculture Industry has

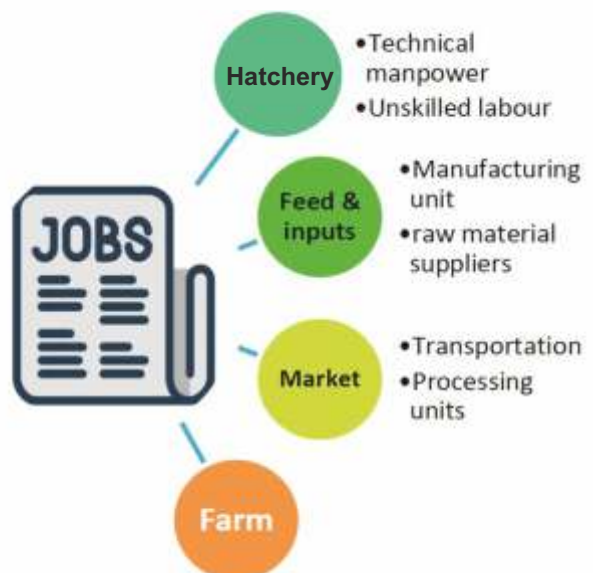


Figure 2 Aquaculture development can lead to several job opportunities

68 Feed Mills with the installed feed production capacity of 2.8 million MT per annum which is almost double the present day requirement.

### **Market for Farmed Produce:**

Most of the candidate species mentioned here have good domestic market demand. However, the export market can also be explored. Indian seafood processing industry has 613 registered seafood processing facilities with the processing capacity of 33,653 MT per day. Also the Indian Seafood Industry has the installed cold storage capacity of 3.87 Lakh MT.

However, market for ornamental fishes and pearls has to be explored in detail, before venturing into these activities

**To conclude:** Entrepreneurs interested to become an Aquaculture farmer or initiate any business ventures related to the input or market systems can explore the possibility of getting support from the Ministry of Fisheries, Animal Husbandry & Dairying or Department of Fisheries. The different Institutes under the Department are mandated to support the stakeholders. It is expected that Aquaculture sector would take advantage of the positive aspects mentioned above and would grow in the forthcoming years and achieve economic progress while maintaining the ecological diversity and environmental sustainability.

## **Crab Farming in India**

Crabs are one of the most relished sea foods and the growing market demand especially during the last two decades led to the development of farming techniques for locally available fast growing species across Asian countries. In 2018, as per FAO estimates, three different species of mud crabs; *Scylla paramamosain*, *Scylla serrata*, and *S. olivacea* were farmed in Asia and an estimated 2,63,271 tonnes were produced mainly from the mangrove habitats and other near shore shallow waters. Apart from this, the blue swimming crab, *Portunus pelagics* and few species of the same genus were also farmed. In India, both these groups of crabs are available and technologies for farming and seed production have also been developed.

Among the mud crabs, *S. serrata* commonly known as Indo-Pacific swamp crab or green crab has supported an artisanal fisheries which has been the main source of livelihood of several families along the east coast. Using special indigenous non-destructive gear, crabs are fished from the dense mangroves of Pichavaram in Tamil Nadu and from Sunderbans in West Bengal. Small scale crab fishery is seen in other states and UTs also where mangroves habitats are common.



**Mud crab farming:** When the demand for live crab increased in the international market, fattening of mud crabs began in a limited scale in several parts of the country. Slowly the need for crab seed increased and hatchery technologies were developed. Though the survival from initial larval stages to stockable size seed is low, the Rajiv Gandhi Centre for Aquaculture (RGCA) is producing seed for farmers. Successful demonstrations of mud crab farming has been carried out by several Institutes in the country.

**Characteristics of mud crabs:** Mud crabs are very sturdy and can tolerate a wide range of salinity variation. They feed on fishes, molluscs and other benthic animals. Similar to other shelled animals like shrimps and lobsters, crabs also discard their shell, a process called 'moulting'. The female crab will carry the eggs and during this phase it is called a "berried crab".

**Site selection:** Mangrove or non-mangrove area can be selected for farming. Abandoned shrimp ponds or



earthen enclosures or open waters can be selected for farming. Turbidity is not a major problem, but water quality should be good. Oxygen levels should be high.

**Crab fattening:** This was the first method to be developed to increase the production and meet the export demand. Undersized crabs are taken from the fishery and grown in ponds or containers / boxes made of bamboo or synthetic material. Later, as demand for bigger crabs began, moulted crabs called "water" or "soft" crabs of medium to large size began to be collected from the natural habitats and grown for a short period. A 200 g water crab can gain about 25-50g in a month and this fattening may continue for 9-10 months. This is a lucrative aquaculture process and widely practised in mangrove areas.

**Crab farming:** Seed crabs are purchased from hatchery and then grown to marketable size in different farming systems. The farms can be either land based earthen ponds or small boxes or closed container systems in open waters. In the pond they are openly stocked or in containers. Prior stocking in main grow-out systems, they are grown in a nurseries where good care is given to increase survival.

**Nursery rearing:** Crab instars (very small seed crabs) of 5-6 mm are stocked @ 90-100 per m<sup>3</sup> in pen enclosures or hapas which are rectangular with a nylon net of 2mm mesh and grown for about 25 to 30 days by providing good feed. When they reach 2.5-4 cm they are harvested and stocked into nursery ponds at the rate of 3-4 individuals per m<sup>2</sup>. Here they are grown for about 45 days and they grow to an average weight of 70 to 80 g. During this period, fast growing ones are removed and stocked separately. This process is called culling and is practised to prevent attack by the larger ones on the slow growing crab-lets.

**Pond farming:** In open pond farming where the depth is 80 to 120 cm, the densities are usually kept low. About 70-80 g size crabs are stocked in grow-out culture ponds at a rate of 0.5-0.7 m<sup>-2</sup>. The boundary of the ponds are provided with strong fences and topped with plastic so that the crabs don't move away from the pond. They are fed chopped trash fish or wet feed prepared using locally available fish/molluscs. They grow to a harvestable size after a culture period of 6 months when the weight increases to 700 -1000 g per crab.

**Cellular or Box farming:** In recent years individual crab farming is practised @ one crab per box and cultured for 4-6 months. wherein they attain 200-400 g for *S. olivacea* and 300-900 g for *S. serrata*. Crabs are known to be cannibalistic, that is, if there is not enough feed, the stronger ones may feed on the weaker crabs. So mostly to avoid this and for better management crab boxes with holes permits free water exchange have been designed and used successfully by farmers.



**Silviculture or canal farming:** In mangrove areas where there are small canals, mud crabs are farmed by local villagers.



**Polyculture:** Crabs are also farmed along with fishes like mullets, milk fish and other fast growing locally available fish so that additional income is ensured. There is no negative impact on crabs due to integrated farming with fishes.

**Production:** *S. serrata* can grow to a size of over 1.5 to 2 kg while *S. olivacea* has been reported to have a maximum weight of 1.2 kg. Mud crabs have huge demand in export and domestic market fetching a price from 8 to 25 USD depending on size and quality. Damage to the crab like breaking of the claw or discoloration on the shell can reduce the price. Hence harvesting is done very carefully. Their capacity to stay

live for 5 to 8 days supports expansion of the live crab market globally.

**The way forward:** Under the Aquaculture development programs of the Ministry of Fisheries, mud crab farming will be promoted especially among the villagers who are financially backward. Though there are issues like low survival and lack of formulated feed, with the available technological advancements, efforts will be made to make the underutilized wet lands into productive aquaculture hotspots. This would also prevent destruction of mangroves which act as a bio-shield to the coastal communities which are more vulnerable to the increasing natural disasters.

# Edible bivalve farming - Prospects for diversified aquaculture opportunities in coastal villages

Edible bivalves like oysters and mussels are considered as nutritionally rich seafood. Their sturdy nature, ease of farming, high market demand and technological progress in seed production and post-harvest processing has promoted growth edible bivalve farming in coastal areas of Asia, Europe Australia and United States. In India, the techniques for farming was developed and popularised by the ICAR-Central Marine Fisheries Research Institute (CMFRI), Kochi and now this has become a source of income in several coastal villages of Kerala. Few villages of Karnataka, Goa, Maharashtra and Tamil Nadu coasts have also adopted these technologies and the estimated annual production is about 10 to 12000 tonnes.



**Bivalve farm structure:** Oysters and mussels are sedentary and farming is done in the open waters of the estuaries and backwaters, unlike the enclosed farms like ponds and cages used for shrimp and fin fish farming.

Though there are different types of farm structures, the most popular in India are the racks or trestles which are simple wooden structures with a platform kept upright by vertical poles. A typical 5m x 5m area rack is fabricated by tying wooden or bamboo poles in shallow areas of the estuaries where there is unpolluted flowing water of salinity above 10ppt and

the depth is between 1.5 to 4m. These farms are not permanent structures and are removed or replaced after two or three crops.

**Oyster farming:** Among oysters, the most common and widely farmed species in the country is the Indian backwater oyster *Crassostrea madrasensis* which is sturdy, has fast growth rate and good meat yield. The rack farms are usually fabricated by the male members of the family and the women and children prepare the 'ren' which is used for oyster seed collection. During oysters spawning period, the floating larvae of the oyster will attach on hard substrates using a glue secreted by its body. Thereafter it grows from the same place by filtering the surrounding water and feeding on the phytoplankton which is naturally available. So farmers suspend the rens from the rack and the oyster seed is collected without any effort. In about five to six months the tiny 2mm oyster spat would grow to harvestable size of 70mm. From a 5m x 5m farm the farmers harvest about 1250 kg (shell-on) of oysters.



**Purification of harvested oysters:** The harvested oysters are usually purified by a process called 'depuration' where they are placed in tanks with purified sea water for 24 hours. The oysters cleanse themselves and this process reduces the bacterial load, empties the gut contents and other matter from the oyster's body. Such oysters can be consumed live and are considered to retain their nutritive qualities to a larger extent with higher nutritive qualities.



**Common village unit:** In Central Kerala where most of the oyster farms are located, there is a common village depuration unit. The women SHG farmers are very efficient. They can operate the depuration unit by themselves and have been trained to hygienically remove the meat from oysters and mussels. Such purified high quality oysters are sold as premium oysters which are consumed live in fresh condition by domestic and international customers in high end restaurants. The farmers get about Rs 65 to 70 per oyster (which was just Rs 2 in 2010) which are consumed live. The demand for live oyster has increased over the years and the farmers now know how to cater to the demand of the industry. Because of the high quality of oyster meat, the farmers get about Rs 550 to 600 per kg of oyster meat and have regular customers.



**Mussel farming:** Mussels are also farmed in estuaries, but they need slightly higher salinity. The same type of rack farms are fabricated. In India the most popular species is the green mussel of *Perna viridis* and the seed for mussel farming is collected from near shore areas and these are wrapped around nylon or coir ropes using a biodegradable cloth. The cloth disintegrates in about two weeks and by then the seed attaches by byssus thread secreted by its body to the rope. Then onwards they grow from these “mussel ropes”. In mussel farming also supplementary feed is not required. Mussels filter the surrounding estuarine water and consume the phytoplankton present in it. They reach harvestable size in 5 to 6 months.



The farmers harvest the crop before monsoon and sell it either as shell-on mussels @ of Rs 175 per kg or they remove the meat and sell as fresh/frozen meat at Rs 700 per kg. From a farm of 5m x 5m, 100 ropes can be suspended and if the seeded length is one meter, the farmers would harvest about 800 kg shell-on (@ 8kg per meter of rope) which would yield about 200 kg meat.

**Potential for replicating success** in other areas is high. Oyster and mussel farming can be taken up in almost all maritime states where there are estuaries with good flowing water. The advantages of bivalve farming are-



1. Supplementary feed is not required. Since bivalves feed on naturally available phytoplankton, additional feed need not be given.
2. The technology is very simple and easily adoptable.
3. The inputs for farming are locally available. The farm structures are made of bamboo or other locally available wooden poles. It is not capital intensive.
4. The farming period is very short; 5 to 7 months.
5. Daily monitoring is not essential, though periodic farm monitoring is required.

**Social advantages** are many. Coastal villages where oysters and mussels are farmed generate several part-time jobs and promote development of other ancillary small business opportunities. The entire village bustles with activity during stocking and harvesting period. Bivalve farming is a women friendly technology. Since the farms can be set up adjacent to their houses in the estuaries, daily commutation to work places is not required. Household responsibilities and farm management can be handled with ease. The experience in carrying out bivalve farming has been found to empower women as Aqua-planners and Aqua-managers

When we are planning of diversifying our aquaculture activities and doubling farmer's income, these two technologies would definitely help to achieve our targets. All maritime states and UTs can plan to identify suitable locations where bivalve farming can be successfully promoted and provide support to the villagers.

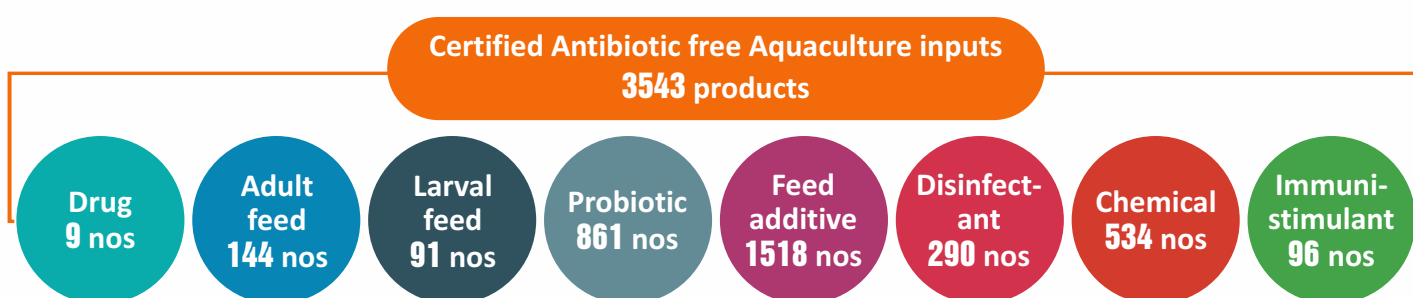
Efforts should be made to provide training to farmer groups and utilize the funds provided under PMMSY so that these technologies form an integral part of coastal livelihoods of the country.

# Coastal Aquaculture Authority (CAA) – Ensuring economic and ecological sustainability of coastal aquaculture activities.

The Coastal Aquaculture Authority was set up under the Coastal Aquaculture Authority Act, 2005 enacted by the Central Government on 23<sup>rd</sup> June, 2005 for regulating the activities connected with coastal aquaculture in the country. The Act mandates the Central Government to take all such measures as it deems necessary or expedient for regulation of coastal aquaculture by prescribing guidelines to ensure that coastal aquaculture does not cause any detriment to the environment and protects the livelihood of various sections of people living in the coastal areas. The Head Quarters of CAA is located at Chennai (Tamil Nadu), and is assisted by State Level Committees (SLCs) and District Level Committees (DLCs) in farm registrations.

**Farm and hatchery registration:** Shrimp farming is one of the focal areas of CAA and so far 40370 farms have been issued registration, 50% of which are in Andhra Pradesh followed by Odisha (27.2 %), West Bengal (10.2%), and Tamil Nadu (4.9%). In all other maritime states and UTs the number of shrimp farms is less than 5 percentage of national total. Apart from farms, all hatcheries are mandated to register with CAA. Periodic inspections are conducted by committees constituted by subject experts from ICAR Institutes and other organisations to oversee that all requirements prescribed in the guidelines of CAA are followed.

**Anti-biotic free inputs:** CAA is responsible for issuance of Standards and Certificate of antibiotic free aquaculture inputs. An advisory published in 2019 mandates all Manufactures and Distributors of aquaculture inputs to submit documents showing the antibiotic-free status of the products such as Health Certificate from the country of origin (for the products/ingredients imported), license from FSSAI (for products/ingredients from India), ISO certificate for process and products, GMP Certificates, HACCP Certificates and other relevant documents.



As on date CAA has received applications from 466 companies and 3543 products of about 8 different inputs have been issued with the Certificate of Standards for Antibiotic-free aquaculture inputs after verification (Fig 1). Such stringent measures have ensured that Indian aquaculture industry produces high quality farmed shrimps.

**Leptopenaeus vannamei farming:** One of the decisions of the Government of India which revived the shrimp farming industry in the country about a decade back granting of legal permission for farming of the exotic species, Pacific whiteleg shrimp *L. vannamei* which was revolutionising shrimp farming in Asia since the year 2000. This species with its sturdy nature and fast growth rate has become the major famed shrimp species in the country (Fig 2). There is a strong national bio-security plan of action to reduce the risk of disease outbreaks and increase production and profit. Guidelines for farming and protocols for hatchery seed production using imported SPF brood stock have been charted out and implementation of these by the sector is closely monitored by CAA in association with other aquaculture R&D institutes. The stakeholder associations have also





supported growth of this industry by ensuring that all involved in the sector follow the rules and regulations charted out by CAA. The CAA by regular inspection keeps a check on violations and takes action by ordering closure of units, cancellation of registration and penalties.

**Specific pathogen-free (SPF) Broodstock:** The CAA identifies SPF brood stock suppliers based on Technical Evaluation Committee's recommendation and empanel them. So far 315 hatcheries with production capacity of 32,347 million post larvae per annum have been issued Letters of Permission and they were permitted to import 8,10,600 numbers of SPF *L. vannamei* broodstock. In addition to this, two hatcheries with production capacity of 300 million post larvae per annum were permitted to import 7,200 numbers of SPF *P. monodon* broodstock.

**Nauplii Rearing Hatcheries:** (NRH) About 60% of the hatcheries who obtained Letter of Permission (LoP) for import of broodstock but purchased nauplii from the registered hatcheries for producing *L.vannamei* seeds.

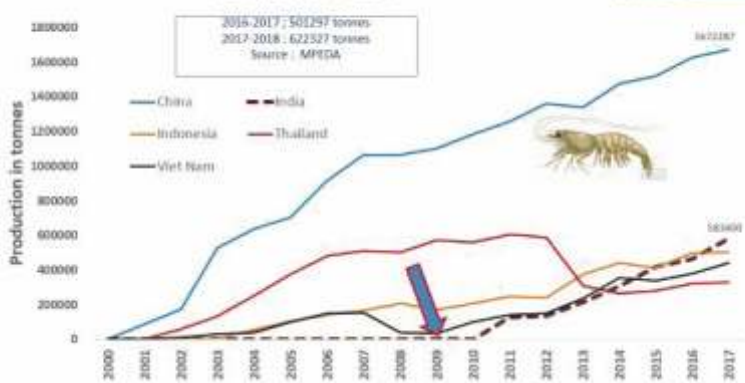
From 2015-16 to 2020-21 (up to July, 2020) the Committee constituted by the CAA, have inspected the hatcheries to evaluate their facilities and on the basis of their reports, 122 hatcheries were given approval by the Authority for setting up of NRH for producing SPF *L. vannamei* seed.



**Global achievement:** As per FAO statistics, in 2017, India is the second largest producer of farmed *L. vannamei* in Asia. This success can be attributed to the stringent measures adopted to implement the bio-security protocols which has prevented disease outbreaks and collapse of the sector. The strong team work involving administrators, researchers, stakeholders including farmers, input suppliers, and exporters has catalysed the growth of shrimp farming in the country during the last 15 years.



Farmed production (in tonnes) of *Leptopeneaus vannamei* in major Asian countries during 2000 to 2017



# Extension strategy: Technology transfer to farmers

India is blessed with vast area of water resources, that provides enormous potential in the fisheries and aquaculture sector and is one of the largest fish producing countries in the world and shares 7.58% to the global production. Fisheries and aquaculture remain an important source of food, nutrition, employment and income for millions, especially the rural populations. In fact, the sector provides livelihood to about 28 million fishers and fish farmers at the primary level and twice the number along the value chain. Foreseeing the immense potential for development of fisheries and for providing focused attention, the Government of India approved the “Pradhan Mantri Matsya Sampada Yojana (PMMSY) to accelerate its development in a sustainable, responsible, inclusive and equitable manner. The Scheme lays down ambitious targets in scaling up production from various subsectors in the coming years, and the comprehensive road map of strategies to achieve its objectives.



The PMMSY also identifies focused areas with little interventions so far, but poses untapped potential for intensification such as seaweed farming, ornamental fisheries, cage culture in open sea as well as reservoirs etc. An exponential development in such sectors from a steady state from the past requires enormous thrust in terms of bringing more stake holders including farmers on board, expansion of cultivable areas, development and adoption of advanced technology, attracting private investments etc. Hence Technology transfer and extension services become highly relevant to boost the production from the fisheries sector in the coming years.

The PMMSY also identifies focused areas with little interventions so far, but poses untapped potential for intensification such as seaweed farming, ornamental fisheries, cage culture in open sea as well as reservoirs etc. An exponential development in such sectors from a steady state from the past requires enormous thrust in terms of bringing more stake holders including farmers on board, expansion of cultivable areas, development and adoption of advanced technology, attracting private investments etc. Hence Technology transfer and extension services become highly relevant to boost the production from the fisheries sector in the coming years.

Technology development and transfer are dynamic, and the success of a new technology is determined by its adaptability and its adoption by, the farmers at ground level. The technology transfer involves the process of formally transferring new discoveries, improved practices or innovations that may result from research institutions into the field. Technology transfer is made possible by the extension services and are very important in the development of rural knowledge and innovative systems for farmers.

Extension has great scope in fisheries because a majority of the stakeholders in primary level in the sector are socially and economically marginalized communities. They deal with common resources and the techniques adopted for the utilization of these resources which will have greater impacts on the socio-economic conditions of the stakeholders and the ecosystem as well. Hence, there is a need for creating awareness amongst them and changing their behavior by informing and educating them. The major areas of scope for fisheries extension are.

Efficiency in fish production

Efficiency in marketing, distribution and utilization

Conservation, development and sustainable use of natural resources

Farm and home management

Youth development

Leadership development

Family living

Public affairs and

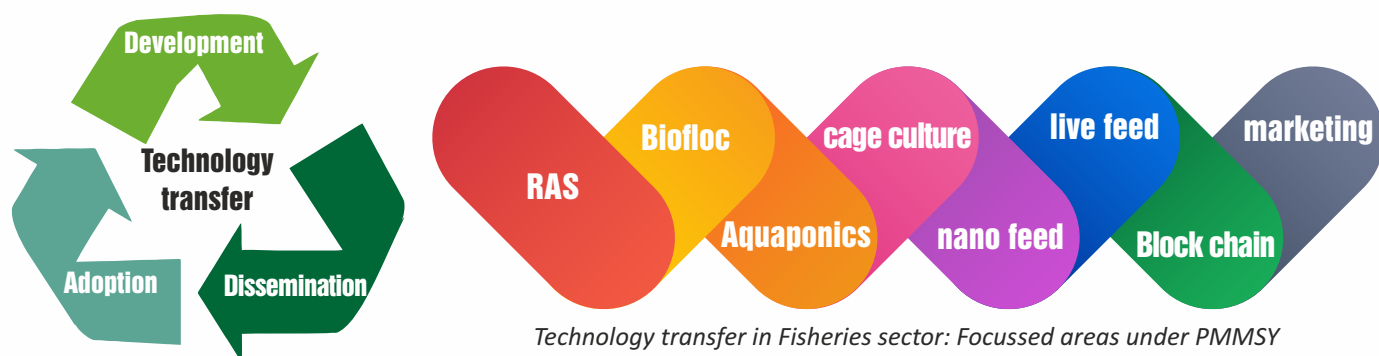
Community development and rural area development

Alternative livelihood means

## Strategies

Process of farming technology transfer is done through three basic stages. The first one is to identify/ develop resource specific and efficient technology secondly the transfer and dissemination of technology to farmers and the third one is to convince farmers to adopt these technologies on their farms. The process of transfer of technologies and of persuading farmers to apply them on farms needs to be done by specialists in agricultural extension who have practical experience in the dissemination of agricultural technologies and know how to deal with farmers. This is done through training courses in various areas of agricultural extension and communication. Hence the Research and Development organizations as well as the fisheries institutions all over the country have to play a major role in achieving the ambitious targets of PMMSY by reaching out to the farmers through the best possible approaches and equip them to accomplish the mission mode objectives of the National action plans.

Under PMMSY, it is proposed to induct and promote adoption of technologies in production and post-harvest management including High-density aquaculture in ponds, Re-circulatory Aquaculture System (RAS), Bio-floc, aquaponics, cage culture, nano-feed, live feed technology, Block chain, value addition, quality preservations and marketing etc. Therefore, under PMMSY, special focus will be accorded for Training and Capacity building of fishers, fish farmers, entrepreneurs, fish workers/vendors and also fishery officials. It is also envisaged to devise a comprehensive action plan to train about 1.5 lakh beneficiaries with an amount of Rs.100.00 crore earmarked towards Training, Awareness, Exposure and Capacity Building under PMMSY. The process will involve consultation with the fisheries research institutes of ICAR and Fisheries Universities and domain experts to induce the required technology to promote modern methods of fish cultivation and fishing through application of modern scientific methods. Further, wherever required and feasible, linkages with the national and international universities and research institutes of repute will be made to obtain the latest technologies in fisheries including skill development/capacity building to adopt such technologies. The approaches in technology transfer under PMMSY will potentially contribute for the development of the fisheries sector into new dimensions and improve the income and livelihood of the fishers and fish farmers all over the country.



*Technology transfer in Fisheries sector: Focussed areas under PMMSY*

## Fishery Survey of India (FSI)

Fishery Survey of India (FSI) was established in the year 1946 as Deep Sea Fishing Station with the objective of augmenting food supply through development of deep sea fishing. It graduated to the status of a survey institute in the year 1974 under the name Exploratory Fisheries Project, with bases known as Offshore Fishing Stations in all the maritime states. The objectives of exploratory fishing and charting of fishing grounds, training of fishing operatives and testing commercial possibilities of deepsea fishing were assigned to it. With the changing developmental needs of the marine fishery sector and the growing data requirements in the context of the Exclusive Economic Zone (EEZ) declaration, the institute has undergone major structural and functional transformations. In 1983, it was reorganized and upgraded as national institute, the Fishery Survey of India with its H/Qrs at Mumbai and Zonal Bases at Veraval, Mumbai, Goa, Kochi, Chennai, Visakhapatnam and Port Blair. It was recognized as a Science & Technology Institute in the year 1988. Consequent to the reorganization the institute has amplified, enlarged and upgraded the scope and contents of its functions and activities. The FSI has thus emerged as the nodal fishery institute in the country with the primary responsibility of survey and assessment of marine fishery resources in the Indian EEZ and adjoining areas for their optimum utilization and sustainable development.



## Mandate:

The mandate of FSI, as modified in the year 1998, is oriented to meeting the data needs of Indian marine fishery for optimizing fishery production as well as for promoting a regulatory framework involving resource conservation and environmental protection. The items of the mandate are as follows.

- Survey and assessment of fish stocks and charting of fishing grounds in the Indian EEZ and adjoining high seas.
- Monitoring of fishery resources for fisheries regulation, management and conservation.
- Assessment of suitability of deep-sea fishing gear with special reference to the concepts of maximum sustainable yield, preservation of environment and ecology of marine ecosystem.
- Marine fisheries forecasting including application of remote sensing in fisheries management.
- Maintaining data on deepsea fishery resources and dissemination of information to different user groups.
- Human resource development through training of fishing operatives and meeting faculty requirements of sister institutes and organisations.

## Major Activities:

**Deep sea resources survey:** FSI has made considerable progress in the investigation of demersal fish stocks in the outer continental shelf. These areas support several un-conventional stocks that are scarcely exploited and some of these are the candidate stocks for further development of shelf fisheries in the country. In order to have coverage of the entire EEZ, FSI continues to undertake intensive trawl survey in these areas all around the mainland.

**Neritic pelagic resources survey:** In view of the large-scale annual variability of pelagic stocks, their appraisal assumes significance for optimum utilisation and responsible management. FSI has made preliminary survey of neritic pelagic stocks by mid - water trawling and purse-seining in some sections of Indian coast.

**Survey of Continental slope resources:** Trawl surveys have revealed availability of several stocks of deep sea crustaceans and fin fishes in different sectors of the continental slope. Some of these stocks are of high economic value but are very sensitive requiring scientific and rational approach in their utilization and management. Trawl surveys are in progress to enable obtaining a complete picture on the resources composition, distribution and stock densities in the continental slope area all along the EEZ.

**Oceanic tuna resources survey:** Earlier surveys have revealed occurrence of some of the principal tuna species, particularly yellowfin tuna, and billfishes in different parts of our EEZ. FSI however continues the tuna longline survey which will enable in generating best scientific knowledge and a sound data base on distribution, availability, seasonality and migratory trend of the larger pelagic stocks in the Indian EEZ and adjoining high seas.

**Andaman & Nicobar resource survey:** The EEZ in and around the Andaman & Nicobar archipelago, forming about 30 per cent of the Indian EEZ, accounts for just one per cent of the fish production. Apparently the development prospects are enormous. FSI is currently undertaking survey of demersal resources in the deeper waters and the continental slope and longline survey for larger pelagic stocks within the EEZ.

**Eco-friendly and diversified fishing practices:** In order to develop and promote technologies and fishing gear which will not add to physical and biological degradation of marine ecosystem and will minimize incidence of by-catch, FSI undertakes experimental fishing with eco-friendly and diversified fishing methods like squid jigging, trap fishing etc.

**Identifying bio-diversity:** As identifying the components of marine bio-diversity is a basic requirement for conservation and monitoring of the bio-diversity and sustainable use of its components as enunciated in the global Convention on Biological Diversity, FSI is building up a species inventory of marine fishery resources in the Indian EEZ.

**Biological Studies:** Studies on size, rate of growth, age distribution, recruitment etc. are central aspects to provide prognosis on development of commercially important resources. Food and feeding habits and prey-predator relationships provide valuable insight to the ecological succession and interaction in the ecosystem. Information on reproductive biology is crucial for identifying some of the conservation and



regulatory approaches. Considering such significance of biological information in scientific management of fishery resources, FSI continues to gather biological data on different stocks.

**Fish Stock Assessment:** Estimates of fishery potential are being increasingly applied as reference points in rational development and scientific management of fisheries. FSI makes assessment of fishery resources in the Indian EEZ by different analytical and production models suitable for tropical fisheries. Assessments are made for individual stocks as well as multi-species fishery with reference to maritime state, regions and on all India basis. The Maximum Sustainable Yield (MSY) from the Indian EEZ has been estimated as 5.31 million metric tonnes. With the additional data being generated in resources surveys and with due regard to the changes taking place in the fishery the estimates are being refined and updated. Variabilities of stock densities and biomass of important stocks are being assessed on yearly basis.

**Application of remote sensing in marine fisheries:** Satellite remote sensing is emerging as a powerful tool in synoptic survey of natural resources. FSI has been associated with the Indian Space Research Organisation in technique development and validation on application of remote sensing in marine fisheries. Currently the effort is focused on development of integrated fishery forecast by synergistic application of Chlorophyll and SST data.

**Marine Census of the Island Groups:** The Department of Fisheries, Government of India envisaged a scheme for strengthening of database and information networking for the Indian fishery sector. The Fishery Survey of India, with its mandate for survey and assessment of fish stocks and charting of fishing grounds in the Indian EEZ and adjoining high seas, assessment of suitability of deep sea fishing gear, marine fisheries forecasting, maintaining data on deep sea fishery resources and dissemination of information to different user groups and human resources development, was recognized as one of the agencies for national level marine fishery census. The Institute was assigned the task of conducting Marine Fishery Census in both the Andaman and Nicobar & Lakshadweep Islands.

#### **National Reporting to Indian Ocean Tuna Commission:**

Govt. of India has assigned the responsibility of preparing the India's National Report to the Indian Ocean Tuna Commission (IOTC) by collecting & compiling the tuna catch data.

**Research and Training:** The Institute also imparts in-vessel training to the passed out students sponsored by the Central Institute of Fisheries nautical Engineering and Training (CIFNET) on-board survey vessels on tenure basis for acquiring sea service as part of Human Resource Development programme of the Institute. The FSI has a wide collaboration with several premier national institutes of the country for multiple research & development programmes. The Institute also been recognized by the University of Mumbai, Andhra University, Goa University, Kochi University of Science & Technology, University of Madras for research leading to Ph.D., & Masters Degree in Science. Scientists of FSI were also recognized by these universities as the research guides for Ph.D., and M.Sc., degree courses.

## **Mission Fingerling**

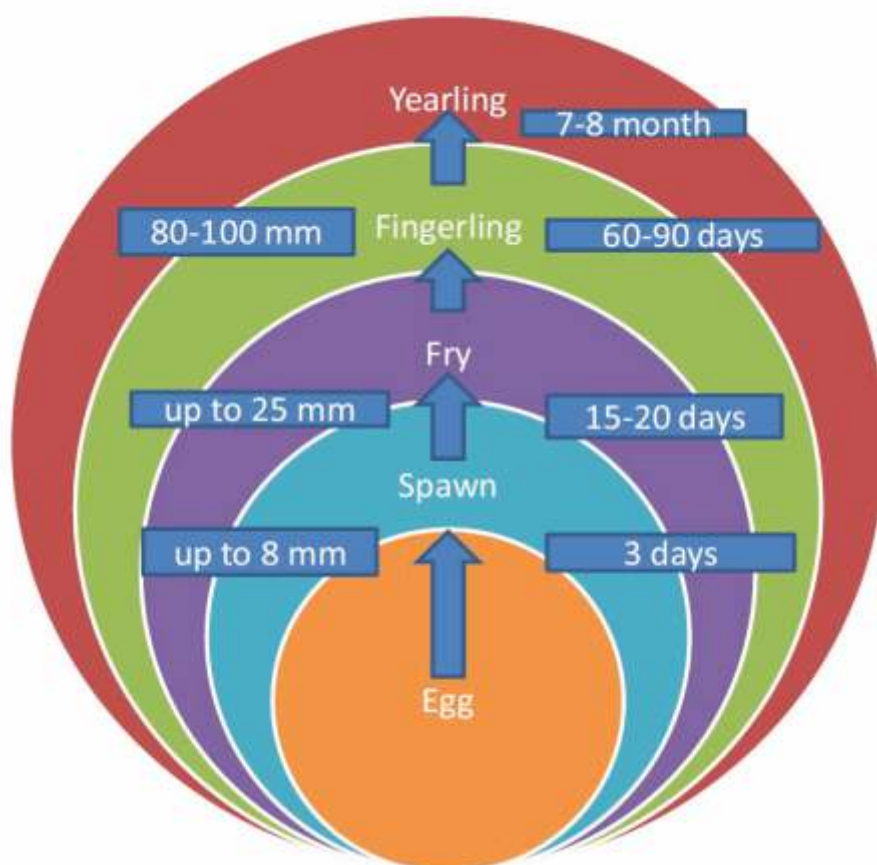
Recognizing the potential and possibilities in the fisheries sector, Government of India has launched a flagship scheme "Pradhan Mantri Matsya Sampada Yojana (PMMSY): A scheme to bring about Blue Revolution through sustainable and responsible development of fisheries sector in India" to unlock the country's latent potential through an integrated and cluster



approach. The **PMMSY**, in its scope and reach, focuses on creating an enabling environment for an integrated and holistic development and management of fisheries for the socio economic development of the fishers and fish farmers. Thrust areas have been identified for enhancing fisheries production from 13.7 MMT (2018-19) to

22 MMT in 2024-25. Stocking of fingerling instead of fry and spawn in aquaculture pond, reservoirs, wetland, cages in reservoirs, recirculatory aquaculture system and bio-floc system is the foremost step for any aquaculture system to increase productivity. The survival rate of fingerlings is always higher in grow out ponds as they are less susceptible for predation, less vulnerable to the disease and more tolerant to environmental fluctuations. It leads to higher production and productivity due to better growth rate because unhealthy juveniles perish during nursery rearing. Advanced fingerlings take less time to reach marketable size, ideal for multiple stocking and harvesting. Ranching of advance fish fingerling in natural environment gives better performance. Rearing of advance fingerling adopted by the farmers with assurance of low mortality and compensatory growth during the grow-out phase fetches better

### LIFE STAGES OF FISH



economical returns. The subsequently growth of the advance fingerlings up to marketable size is believed to be rapid. Hence, Mission Fingerling has identified as top priority activities under PMMSY. Use of High Yielding Varieties of brooders is another significant aspect which has to be addressed on priority under PMMSY. This quality seed mission with a total expenditure of about Rs. 2200 crore under PMMSY will facilitate the establishment Brood Bank, hatcheries, fish seed rearing pond, Aquatic Quarantine Facilities, Traceability, Standards, Certification and Accreditation, Import of germplasm and Genetic Improvement programme of commercial species in the country. The implementation of this program will supplement the requirement of stocking materials in the country up to a large extent, which is a much needed input to achieve the enhanced fish production target of 7.0 million tons by the year 2024-25.

Freshwater aquaculture is the mainstay of aquaculture practice in India contributing 90% of the total aquaculture production there is huge scope to increase the production from fresh water aquaculture further by stocking fingerling, therefore, under PMMSY target has been fixed to enhance the national pond productivity to 5 tons/ha/yr from the existing 3 tons/ha/yr with an integrated and cluster approach. Reservoirs are usually

called 'sleeping giants' for enhancing fish production and community benefits because their potential is untapped. The intervention plans for the reservoirs development are aimed at integrated development of reservoirs promoting supplementary stocking with quality fingerlings of Indian major carps, minor carps and creation of adequate space for in-situ hatcheries and fish seed rearing facilities for production of large sized quality fingerlings for stocking. Under PMMSY target has been fixed for annual fish yield of 1000kg/hectare, 500 kg/hectare and 200 kg/hectare in small, medium and large reservoirs respectively. Further, small reservoir will be focused with pen culture facilities to achieve the productivity target.

### **Production of Standard Fingerling: Key Steps**

- Rearing and nourishing of quality brooders round the year to get better offspring in breeding season
- Commencing breeding operations early during monsoon season to maximize the time availability for growth of reared fry at higher densities for 2-3 months.
- Rearing spawn in large quantities @ 50.00 lakh to 1.0 crore/hectare followed by rearing of fry to raise fingerling @ 5.0 lakh/hectare
- Supply of superior fingerling in healthy culture environment to ensure faster growth and higher survival rate

## **Pearl Farming**



Pearls are produced from both marine and fresh waters oysters. As the oyster grows in size, its shell also grows. The mantle is an organ that produces the oyster's shell, using minerals from the oyster's food. The material created by the mantle is called nacre and this nacre lines the inside of the shell. The formation of a natural pearl begins when a foreign substance slips into the oyster between the mantle and the shell, which irritates the mantle. The oyster's natural reaction is to cover up that irritant to protect itself. The mantle covers the irritant with layers of the same nacre substance that is used to create the shell. This eventually forms a pearl. So a pearl is a foreign substance covered with layers of nacre.

Cultured pearls are created in the same process as natural pearls, but are given a slight nudge by pearl harvesters. To create a cultured pearl, the harvester opens the oyster shell and cuts a small slit in the mantle tissue. Small irritants are then inserted under the mantle. In freshwater cultured pearls, cutting the mantle is



enough to induce the nacre secretion that produces a pearl and an irritant doesn't have to be inserted. While cultured and natural pearls are considered to be of equal quality, cultured pearls are generally less expensive because they aren't as rare.

Pearls are precious gems having aesthetic importance and their market price is influenced by consumer demands, levels of production and supply, quality control and market perceptions. Most pearls that we see in jewelry stores are nicely rounded objects, which are the most valuable ones. Not all pearls turn out so well. Some pearls form in an uneven shape ; these are called baroque pearls. Pearls, as you've probably noticed, come in a variety of various colors, including white, black, gray, red, blue and green. Most pearls can be found all over the world, but black pearls are indigenous to the South Pacific.

### **Marine pearls:**

Marine pearls are produced from the species distributed in the Gulf of Mannar, Palk Bay, southern Kerala and Gulf of Kutch and the black lip pearl oyster, in the Andaman and Nicobar Islands. Technology for marine pearl production was developed by the CMFRI. Based on these developments, many large scale commercial ventures and societal programmes were initiated near natural pearl oyster beds, particularly in Tamil Nadu and Kerala. However, due to several logistic reasons (primarily long duration of culture and risks of sea based farming), these ventures could not sustain. Currently, there is no commercial production of cultured marine pearls in the country as reported by the ICAR-CMFRI. National developmental agencies like NFDB and State Fisheries Depts shall involve in promoting freshwater pearl culture technology to the end users as the reach of research institutes with limited manpower capacity is limited. ICAR-CMFRI and ICAR-CIFA can be the partners with these agencies in providing technical backstopping.

### **Fresh water pearls:**

Freshwater pearls are produced mainly from the species Freshwater pearl farming is one of the most lucrative



businesses. The ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar has developed the technology of growing pearls in fresh water. In India, commercial production of freshwater pearls is very meager. The ICAR-CIFA is also organising training programs for the farmers, entrepreneurs and researchers on various



aspects of pearl farming to develop entrepreneurship. Some of the farmers from different parts of the country after getting training have also started their pearl farming venture. User-friendly manuals in Hindi, Odia and English have been prepared to cater the needs of different categories of farmers. Apart from that, leaflet in Marathi, Odia, Hindi and Bengali on Designer Pearl Technology are also available to reach some states where the technology is in much demand. It is reported by ICAR-CIFRI that a farmer near Surat has produced a 48 carat pink pearl weighing 15 grams and he has also produced pearls of different sizes and shapes including Ganesha, Jesus Christ and Sai Baba. A Hyderabad-based businessman owning his pearl farm is also involved in pearl farming activities and has adopted the technology since 2000. An entrepreneur from Odisha has been successfully produced designer pearls of good quality in Balasore, Odisha, India. Based on survey conducted by ICAR-CIFA, it is found that most of the states having freshwater bodies are suitable for freshwater pearl farming. For example West Bengal, Bihar, Odisha, Karnataka, Gujarat, Rajasthan, Maharashtra, Punjab, Madhya Pradesh, Chhattisgarh and North Eastern States.

### **Actions initiated by the Department of Fisheries:**

Considering the scope of pearl farming, the Department of Fisheries has included a sub-component for pearl culture in the Blue Revolution scheme for encouraging the sector. All the States / UTs were requested to promote the pearl farming in the States availing the financial assistance from the Department of Fisheries under the Blue Revolution scheme.

### **Assistance for Pearl culture under Pradhan Mantri Matsya Sampada Yojana (PMMSY)**

The Department of Fisheries under the **Pradhan Mantri Matsya Sampada Yojana (PMMSY)** envisages for promoting Bivalve cultivation including pearl culture in India as diversified aquaculture practice. This component has been included for promoting pearl culture both in marine and freshwater. The unit cost for bivalve cultivation including pearl culture is Rs. 0.2 lakh per unit which includes the capital cost and one-time input and operational cost. The beneficiaries have to obtain necessary permission for allotment of sea area by the respective State Governments / UTs as per the prevailing leasing policy. The beneficiaries are required to prepare a self contained proposal indicating techno financial details together with documentary evidence of necessary permission and technical knowhow. Governmental financial assistance is restricted to 5 units for individual farmer/beneficiary; 50 units for fishermen / fisherwomen Cooperative Societies,

SC/ST Cooperative Societies, Women SHGs etc having at least 10 members. The proposal is to be routed through the concerned State Govt/UT Administration with clear recommendations. Detailed guidelines in respect of CSS have been uploaded in this Department's website [www.dof.gov.in](http://www.dof.gov.in) and [www.nfdb.gov.in](http://www.nfdb.gov.in).

## **Cold Water Fisheries Sector**

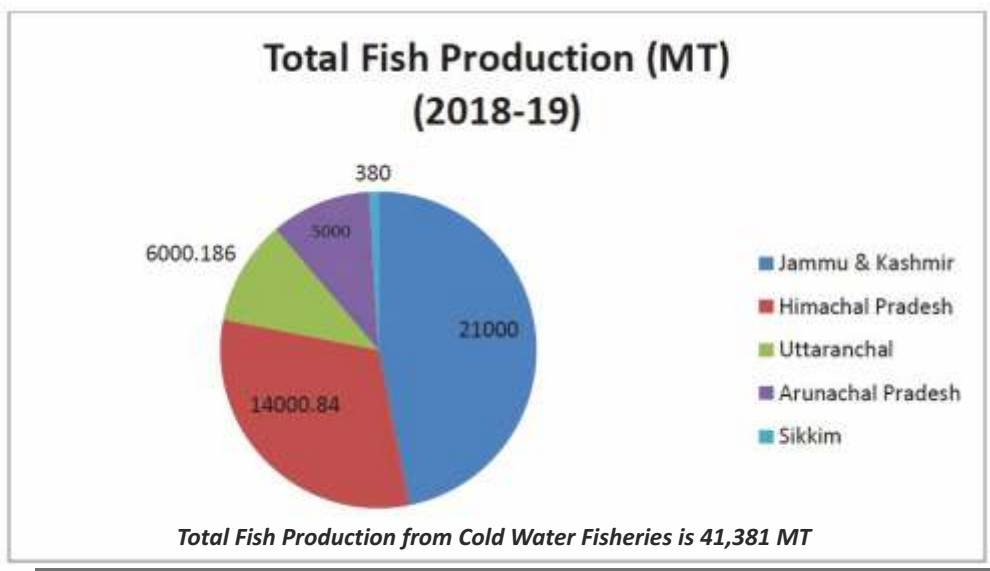
When they say water is life and is an essential component, they have good reasons. Besides quenching thirst, water is used to cook, bathe, wash and irrigate crops among others. Water is also an essential component in Fisheries and Aquaculture practices as it supports life (Zooplankton, Phytoplanktons, Larvae, Fish life etc). Thus, practically from the very beginning of history, fish have become an inseparable part of human life. It has helped to create physical energy as a source of protein, though the primitive people did not possess that kind of scientific knowledge. Fish has played a very significant role to man kind



since ancient times and continues to play a significant and important role even today. Fish plays an important role in human nutrition in India and it contributes to the domestic food security of the nation. Addressing food and nutritional security is a matter of urgent and utmost importance. Fish is one of the world's most important sources of protein.

In Indian agro climatic conditions, fisheries and aquaculture are fragmented into inland and marine resources based productions. The fish production has increased from 5.66 MMT in 2000-01 to 12.61 MMT in 2017-18 (P) with a contribution of 8.92 MMT from inland sector and 3.69 MMT from marine sector. In inland water resources, cold water fisheries and aquaculture occupies significant importance comprising natural reservoirs and also includes man made

small and big reservoirs. The cold water fishery resource of India spread throughout 2500 km from UT of Jammu & Kashmir in the west to Arunachal Pradesh in the east and 200-400 km from north to south comprise a mountainous area of 5,33,604 km<sup>2</sup>. The geographical area of this region is about 16.2% and about 4% of total population of the country. The Cold water resources are distributed mainly in the form



of upland streams, rivers, high and low altitude lakes and reservoirs located in different hill states like UT of Jammu & Kashmir, UT of Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and hills of Assam and West Bengal. There are 16 big and small rivers in Himalayan and peninsular regions having an area of about 3885 km. Apart from these rivers area of natural lake's is 20500 hectares. The man made reservoirs are spread over an area of 265000 hectares.

Coldwater fishes occupy an important place amongst the freshwater fishes of India. Coldwater fisheries have a great potential in generating rural income and providing food security to the rurals in Indian uplands and its sustainable utilization and development have assumed importance in coldwater regions of the country. Government of India established National Research Centre on Cold Water Fisheries (NRCCWF). It has played a significant role in the improvement and conservation of indigenous as well as in the establishment of exotic species in cold water region.

Through Centrally Sponsored Schemes, Government of India has made several efforts to develop cold water fisheries region of India, yet there are lot of areas which needs immediate attention for their development. There are difficult terrains and remote areas prevailing in hill regions which makes approach to reach these places very difficult and curtail necessary fisheries development activities.

The current fish production in the cold water fisheries region is 41,381 MT ( 2018-19) which the Government of India wants to increase to 1 Lakh MT by 2025. Also, the Government has set up the target to double the income of farmers. This target can be achieved through the active participation of Agri- Entrepreneur and Converging various schemes run by the Government.

- Entrepreneurs and Startups can help in building the value chain required for developing a robust cold water fisheries economy. The various area potential areas (but not limited to) where the entrepreneurs can contribute are as following:-
  - Research and development including Bio tech

- Implementation of modern technologies such as AI, IoT and ML
- Captive production
- Storage facilities
- Feed supplies
- Aquatic life healthcare and disease control
- Supply chain and logistics including cold storage
- Sports in coldwater ponds/lakes rivers
- Sustainable leisure fishing and ornamental fisheries

What we refer to as the era of convergence, it is expected to open new opportunities and possibility for overall growth of the sector. Government under Ministry of Commerce and Industry is already helping Startups through various schemes to several Ministries and also Skill India under Ministry of Skill Development and Entrepreneurship is helping in developing skill sets to several Ministries. We can converge and capitalize through Startup India and also with other Ministry like Ministry of Electronics and Information Technology as well as NITI Aayog to endorse entrepreneurship as well as in technology development in Cold Water Fisheries areas as convergence brings the opportunity for greater operational efficiency and the potential for contributions toward the organization's profitability.

## Benefits of Having Aquariums at Work Place, Homes, Public Places Etc

Famous proverb that goes like this “give a man a fish and you feed him for a day, teach him how to fish and you feed him for a lifetime.” What can be understood is that people should take responsibility for their health, lives, surroundings, habitat, environment etc. These days, society and the workplace put an unparalleled level of pressure on people. The signs of stress are omnipresent, and its consequences are numerous. The stress that we experience every day is essentially caused by several phenomena that are inherent to today's society. The stress level may be due to intensified workload to increase productivity gains, constant search for perfection, obsession with competition, difficulty balancing work, personal life and family life, major changes in values and social standards. In a world that's moving faster than we can keep up with, it's important to find time to slow down, sit back, and relax. They had been several studies that have shown significant reduction in the level of stress after exposure to color, it may be called colour therapy.

Research carried out in back in 2005 found that “contact with nature may provide an effective population-wide strategy in prevention of mental ill health like stress, anxiety. One such good stress buster we can account upon are fish in aquariums at work place as well as home. Watching fish swim is an odd but effective way to relax. Studies have shown that aquariums have a soothing effect on our nerves. People who are provided with a fish tank display considerably lower levels of blood pressure, pulse rate, stress and anxiety. Patients who have undergone surgery require less pain medication after seeing fishes.

Both these elements - water and animals are known have a comforting effect. It is like listening to good music or watching a beautiful painting or photograph. It brings you peace.” It is said that watching fishes swim in the aquarium can minimise your stress levels and blood pressure and in turn, make you feel calm. Interestingly, this is the reason why we have always seen an aquarium at our dentist's and doctor's clinic. Some of the popular species you could opt for aquariums at work and house include the Arowana or the Dragon Fish, Angelfish, Koi, Gold Fish, Tosakin, Shubunkin, Silver Dollar Fish, Calico, Loach catfish, Black Ruby Barb, Denison Barb, Gold Barb, Rosy Barb, Tiger Barb, Tinfoil Barb, Zebra Barb, Dwarf Spotted Danio, Giant Danio, Pearl Danio, Rosy Danio, Zebra Danio, Gourami Species Blue/Three Spot Gourami, Chocolate Gourami, Dwarf Gourami, Kissing Gourami,



Moonlight Gourami, Pearl Gourami, Adolfo's Cory, Bandit Cory, Blackfin Cory, Bronze Cory, Julii Cory, Panda Cory, Pepper Cory, Skunk Cory, Three Lined Cory, Common Hatchetfish, Marbled Hatchetfish, Black Neon Tetra, Black Phantom Tetra, Black Widow Tetra, Bleeding Heart Tetra, Blind Cave Fish, Buenos Aires Tetra, Cardinal Tetra, Emperor Tetra, Glowlight Tetra, Head and Tail Light Tetra, Neon Tetra, Red Eye Tetra, Rummy Nose Tetra, Serpae Tetra, Axelrod's Rainbow, Boesman's Rainbow, Lake Kutubu Rainbow, Lake Wanam Rainbow, Madagascar Rainbow, Neon Rainbow etc.

When using a large live aquarium exhibit, it is found that there was improvement in mood of people and also drop in heart rate when they viewed more, versus less, fish. A study in the 90's have shown that watching



aquariums can improve Alzheimer's patients' eating habits and behavioral patterns. People with advanced Alzheimer's disease are often so agitated that they don't stop for meals and lose weight to the level of endangering their health. Fish tanks/ aquariums hold the attention of these patients and they significantly gain weight and are less of a burden for others.

Studies also confirm that watching fish in an aquarium can be effective in reducing anxiety in patients awaiting dental surgery. Aquariums can also help adults and children with autism and ADHD. With increasing scientific evidence to support the effectiveness of animal-assisted interventions, there should be promotion for keeping aquariums in hospitals, nursing homes, schools, offices buildings, parks etc.

Today, aquariums and ornamental fishes are considered as a consumer based commodity and is the star product of the pet markets. There is an urgent requirement of setting up new technologies and policies that will help in attaining a sustainable ornamental fish industry (Marine ornamental fish, Freshwater ornamental fish, Cold Water ornamental fish and Brackishwater ornamental fish). At present, the popularity for freshwater ornamental fish in market is more as they are very easy access for breeding and they also don't require salinity. Due to Research and Development in ornamental fisheries sector new cross breeds of ornamental fishes are also developed in this sector which are more attractive and are able to fetch high price in export market.

In present scenario there are large numbers of fisheries set up in India for uplifting the fisheries sector but due to lack of training facilities and awareness the expansion of avenues has not been propagated. There is a high need for creation of training centers with facilities on ornamental fish breeding as it will help to generate employment opportunity for unemployed youth. Being highly remunerative sector it is considered as a major source of employment generation and there are career avenues in various branches of fisheries and aquatic sciences.



# Beneficiary schemes under PMMSY

**PMMSY envisages an investment of Rs 12,340 crores for taking up of Beneficiary oriented activities.**

Sl. No	Sub-component and Activities	Unit cost (Rs. lakhs)	Governmental Assistance (Rs. lakhs)	
			General (40%)	SC/ST/ Women (60%)
(i)	(ii)	(iii)	(iv)	(v)
<b>A</b>	<b>ENHANCEMENT OF PRODUCTION AND PRODUCTIVITY</b>			
	<b>Development of Inland Fisheries And Aquaculture</b>			
1	Establishment of New F.water Finfish Hatcheries (Nos)	25.00	10.00	15.00
2	Establishment of New F.water Scampi Hatcheries (Nos)	50.00	20.00	30.00
3	Construction of New Rearing ponds(nursery/seed rearing ponds) (Ha)	7.00	2.80	4.20
4	Construction of New Grow-out ponds (Ha)	7.00	2.80	4.20
5	Inputs for fresh water Aq.culture including Composite fish culture, Scampi, Pangasius, Tilapia etc.(Ha)	4.00	1.60	2.40
6	Establishment of need based New Brackish Hatcheries (shell fish and fin fish)(Nos)	50.00	20.00	30.00
7	Construction of New ponds for Brackish Water Aquaculture. For polythene lining, an additional assistance up to Rs. 2 lakh/Ha may be provided to beneficiaries (General/SC/ST/Woman) as per approved sharing basis (Ha).	8.00	3.20	4.80
8	Construction of New ponds for Saline /Alkaline areas. For polythene lining, an additional assistance up to Rs. 2 lakh/Ha may be provided to beneficiaries (General/SC/ST/Woman) as per approved sharing basis (Ha).	8.00	3.20	4.80
9	Inputs for Brackish Water Aquaculture (ha)	6.00	2.40	3.60
10	Inputs for Saline /Alkaline Water Aquaculture (Ha)	6.00	2.40	3.60
11	Construction of Biofloc ponds for Brackish water/Saline/Alkaline areas including inputs (Ha)	18	7.20	10.80
12	Construction of Biofloc ponds for Freshwater areas including inputs (Ha)	14.00	5.60	8.40
13	Stocking of Fingerlings in Reservoirs @1000FL/ha(3.0 lakh/1lakhFL)(Ha)	Rs 3/ seed	Rs 1.2/ seed	Rs 1.8/seed
14	Stocking of Fingerlings in Wetlands @1000FL/ha (3.0 lakh/1lakh FL)(Ha)	Rs 3/ seed	Rs1.2/ seed	Rs 1.8/seed
	<b>Development of Marine Fisheries including Mariculture and Seaweed cultivation</b>			
15	Construction of Small Marine Finfish Hatcheries (Nos)	50.00	20.00	30.00
16	Construction of large Marine Finfish Hatcheries (Nos)	250.00	100.00	150.00

17	Marine Finfish Nurseries(Nos)	15.00	6.00	9.00
18	Establishment of Open Sea cages (100-120 cubic meter volume)(Nos)	5.00	2.00	3.00
19	Establishment of Seaweed culture rafts including inputs (per raft).(Nos)	0.015	0.006	0.009
20	Establishment of Seaweed culture with Monoline/tubenet Method including inputs (one unit is approximately equal to 15 ropes of 25m length) (Nos)	0.08	0.03	0.05
21	Bivalve cultivation (mussels, clams, pearl etc.)(Nos)	0.20	0.08	0.12
<b>Development of fisheries in North-eastern and Himalayan States/UTs</b> (Besides the below activities, the N.E and Himalayan States/UTs will also be assisted under other sub-components/activities envisaged under PMMSY common to all states/UTs).				
22	Establishment of Trout Fish Hatcheries. (Nos)	50.00	20.00	30.00
23	Construction of Raceways of minimum of 50 cum.m (Nos)	3.00	1.20	1.80
24	Inputs for Trout Rearing Units.(Nos)	2.50	1.00	1.50
25	Construction of New Ponds.(Ha)	8.40	3.36	5.04
26	Establishment of medium RAS for Cold water Fisheries. (with 4 tank of minimum 50 m <sup>3</sup> /tank capacity and fish production capacity of 4 tonne/crop) (Nos)	20.00	8.00	12.00
27	Establishment of large RAS for cold water fisheries. (with 10 tanks of minimum 50 m <sup>3</sup> /tank capacity and fish production capacity of 10 tonne/crop)(Nos)	50.00	20.00	30.00
28	Input support for Integrated fish farming (paddy cum fish cultivation, livestock cum fish, etc). (Ha)	1.00	0.40	0.60
29	Establishment of Cages in cold water regions.(Nos)	5.00	2.00	3.00
<b>Development of ornamental and recreational fisheries</b>				
30	Backyard Ornamental fish Rearing unit (both Marine and Fresh water) (Nos)	3.00	1.20	1.80
31	Medium Scale Ornamental fish Rearing Unit (Marine and Freshwater Fish)(Nos)	8.00	3.20	4.80
32	Integrated Ornamental fish unit (breeding and rearing for fresh water fish )(Nos)	25.00	10.00	15.00
33	Integrated Ornamental fish unit (breeding and rearing for marine fish)(Nos)	30.00	12.00	18.00
34	Establishment of Fresh water Ornamental Fish Brood Bank. (Nos)	100.00	40.00	60.00
35	Promotion of Recreational Fisheries. (Nos)	50.00	20.00	30.00
<b>Technology Infusion and adaptation</b>				
36	Large RAS (with 8 tanks of minimum 90 m <sup>3</sup> /tank capacity and production 40 ton/crop)/Biofloc culture system (50 tanks of 4m dia and 1.5 high).(Nos)	50.00	20.00	30.00
37	Medium RAS (with 6 tanks of minimum 30m <sup>3</sup> /tank capacity with production capacity of 10ton/crop)/ Biofloc culture system(25 tanks of 4m dia and 1.m high)(Nos)	25.00	10.00	15.00

38	Small RAS (with 1 tank of 100m <sup>3</sup> capacity/Biofloc (7 tanks of 4m dia and 1.5 high) culture system(Nos)	7.50	3.00	4.50
39	Establishment of Backyard mini RAS units(Nos)	0.50	0.20	0.30
40	Installation of Cages in Reservoirs(Nos)	3.00	1.20	1.80
41	Pen culture in open water bodies (Nos)	3.00	1.20	1.80
<b>B</b>	<b>POST HARVEST AND COLD CHAIN INFRASTRUCTURE</b>			
<b>42</b>	<b>Construction of Cold Storages/Ice Plants</b>			
(a)	Plant/storage of minimum 10 tonne capacity(Nos)	40.00	16.00	24.00
(b)	Plant/storage of minimum 20 tonne capacity(Nos)	80.00	32.00	48.00
(c)	Plant/storage of minimum 30 tonne capacity(Nos)	120.00	48.00	72.00
(d)	Plant of minimum 50 tonne capacity(Nos)	150.00	60.00	90.00
43	Modernization of Cold storage /Ice Plant (Nos)	50.00	20.00	30.00
44	Refrigerated vehicles(Nos)	25.00	10.00	15.00
45	Insulated vehicles(Nos)	20.00	8.00	12.00
46	Motor cycle with Ice Box (Nos)	0.75	0.30	0.45
47	Cycle with Ice Boxes (Nos)	0.10	0.04	0.06
48	Three wheeler with Ice Box including e-rickshaws for fish vending(Nos)	3.00	1.20	1.80
49	Live fish vending Centres (Nos)	20.00	8.00	12.00
<b>50</b>	<b>Fish Feed Mills</b>			
(a)	Mini Mills of production Capacity of 2 tonne /Day (Nos)	30.00	12.00	18.00
(b)	Medium Mills of production Capacity of 8 tonne/Day (Nos)	100.00	40.00	60.00
(c)	Large mills of production Capacity of 20 tonne/Day (Nos)	200.00	80.00	120.00
(d)	Fish Feed Plants of production Capacity of at least 100 tonne /Day. (Nos)	650.00	260.00	390.00
	<b>Markets and Marketing infrastructure</b>			
51	Construction of fish retail markets including ornamental fish/aquarium markets. (Nos)	100.00	40.00	60.00
52	Construction of fish kiosks including kiosks of aquarium/ ornamental fish (Nos)	10.00	4.00	6.00
53	Fish Value Add Enterprises Units (Nos)	50.00	20.00	30.00
54	E-platform for e-trading and e-marketing of fish and fisheries products(Nos)			
	<b>Development of Deep Sea Fishing</b>			
55	Support for acquisition of Deep sea fishing vessels for traditional fishermen(Nos)	120.00	48.00	72.00
56	Up gradation of existing fishing vessels for export Competency (Nos)	15.00	6.00	9.00



57	Establishment of Bio-toilets in mechanised fishing vessels (Nos)	0.50	0.20	0.30
	<b>Aquatic Health Management</b>			
58	Establishment of Disease diagnostic and quality testing labs(Nos)	25.00	10.00	15.00
59	Disease diagnostic and quality testing Mobile labs/clinics (Nos)	35.00	14.00	21.00
<b>C</b>	<b>FISHERIES MANAGEMENT AND REGULATORY FRAMEWORK</b>			
	<b>Monitoring, Control and Surveillance</b>			
60	Communication and /or Tracking Devices for traditional and motorised vessels like VHF/DAT/NAVIC/Transponders etc. (Nos)	0.35	0.14	0.21
	<b>Strengthening of safety and security of fishermen</b>			
61	Support for providing safety kits for fishermen of Traditional and motorized fishing vessels (other than Communication and/or Tracking Device mentioned at 60 above)(Nos)	1.00	0.40	0.60
62	Providing boats (replacement) and nets for traditional fishermen (Nos)	5.00	2.00	3.00
63	Support to Fishermen for PFZ devices and network including the cost of installation and maintenance etc.(Nos)	0.11	0.044	0.066
	<b>Fisheries Extension and support services</b>			
64	Extension and support Services. (Nos)	25.00	10.00	15.00
65	Sagar Mitras	Incentive to Sagar Mitras will be shared by centre and states as per funding pattern of PMMSY.		
	<b>Insurance of fishing vessels and fishermen</b>			
66	Insurance to fishing vessels(Nos)	Premium subvention amount will be shared by center, states and beneficiaries as per funding pattern of PMMSY		
67	Insurance to fishers, fish farmers, fish workers and any other category of persons directly involved in fishing and fisheries related allied activities.(Nos)	Entire premium amount will be shared between center and concerned states as per funding pattern of PMMSY.		
	<b>Livelihood and nutritional support for fishers for conservation of fisheries resources</b>			
<b>68</b>	Livelihood and nutritional support for socio-economically backward active traditional fishers’ families for conservation of fisheries resources during fishing ban/lean period.(Nos)	As per details guidelines of PMMSY		

# Success story on sea cage farming by tribal society in Gujarat



## The Tribals...

Shri Hasambhai Musangara, member of a Primitive Tribal Group (PTG) in Veraval have been making his livelihood from labour jobs in the fishing harbour and processing industry, 'chakda' rikshaw driving for transporting fish etc. for the last many years. Being landless, the tribals had to resort to such odd jobs to maintain their family. The 'Sidi' is a unique tribal group mainly found in three Indian states i.e., Gujarat, Karnataka, and Andhra Pradesh. The fisheries potential of the coastal town of Veraval is well known for ages and the tribals who migrated to the City of Veraval had to resort to chores related to fisheries for livelihood. These tribals were on the look for better and regular livelihood means to sustain their family.

## The programme...

Central Marine Fisheries Research Institute (ICAR-CMFRI) pioneered development of indigenous technology for the farming in the sea with active support of the Govt. of India and actively popularized the farming technology all through the coastal areas of the country by different regional offices of the Institute. To overcome the inherent inhibitions of the coastal folks to adopt this new technology, the institute employed many new and interesting means and succeeded in making breakthroughs in few areas. One such innovative and successful case is the story of Shri Hasambhai Musangara of Veraval, Gir Somnath, Gujarat. His success story has ushered the fisheries industry of the state that has been challenged with declining fish catch, under utilization of (an over-capacitated) fish processing industry and the dwindling export trade by demonstrating that the farming is possible in the seas of Gujarat.

About 22 Galvanised Iron sea cages of 5m diameter in the sea off Veraval for the Tribal Society presided by Shri Hasanbhai Musangara was arranged by the CMFRI under the Tribal Sub Coast Plan (TSP) outlay of the Institute. The intention was to popularise the technology for the cage farming through participatory demonstration as well as developing the tribals as the mentors for the cage farming in the state; thereby providing them a regular and quality livelihood thereby enhancing their social status and acceptability while creating the much needed skilled work force for propagation of the sea cage farming in the region.

Capacity building of the tribals were built in sea cage farming by hands-on training at Veraval and other field centres of ICAR-CMFRI like the Karwar and Mandapam as well as at the Headquarters, Kochi. The tribals were specifically trained in cage fabrication, mounting of accessories, mooring preparation and deployment, lobster seed collection, packing and transportation, cobia grow out practices etc. The tribals were also supported financially for maintenance of crops (spiny lobster / cobia) every year. Thus, the tribals were empowered to operate the sea cage farm by themselves and they obtained four crops of lobsters/ cobia.

The farming has empowered the poor and landless tribals to have a quality livelihood and made them leaders in the sector. They are now mentors for this novel technology –the sea cage farming introduced by the ICAR-CMFRI in this region.

### Benefits...

The successful farming operations by the tribal community have made the technology visible to the public as well as the administrators which lead to the visit by the Honourable Minister for Agriculture, Govt. of India accompanied by the Secretary to the Government of India, DAHD&F for witnessing the sea cage farming. The tribal farmer from Veraval was felicitated by dignitaries during this meeting for his lead in the area. There has been a flow of young entrepreneurs from Gujarat as well as Maharashtra to the Centre to seek more about the technology. A few entrepreneurs from Gujarat and Maharashtra interested in taking up sea cage farming venture were assisted by identifying suitable sites as well as by preparing indicative project proposals for submission to the financing institutions / Department of Fisheries. Many batches of fishermen, students and administrators have been trained in sea cage farming by the Institute with hands on experience in the farm. During the visit of the Honourable Chief Minister and distinguished Minister of Agriculture, Govt. of Gujarat to Veraval on 25<sup>th</sup> January 2016; wherein they happened to witness the cage culture initiatives which have paved way for rolling out a scheme by the Govt. of Gujarat for development sea cage farming in the state.

### The Award....

In this regard, Shri Hasanbhai Musangara Jumabhai, the President of the Fishermen Cooperative Society- Bharat Adimjuth Matsyodyog Mandali, Talala, a society of the 'Sidi' community, a Primitive Tribal Group (PTG) has been awarded the prestigious Pandit Deen Dayal Upadhyay Antyodaya Krishi Puraskar of the ICAR for the year 2015 for the Zone-Gujarat and Rajasthan.

### Assistance for sea cage farming under Pradhan Mantri Matsya Sampada Yojana (PMMSY)

The Department of Fisheries under the **Pradhan Mantri Matsya Sampada Yojana (PMMSY)** envisages promotion of sea cage farming in India as diversified mariculture practice. The unit cost for establishment of open sea cages (100-120 cubic M) is Rs. 5.00 lakh which includes the capital cost and one-time operational and maintenance cost. The beneficiaries have to obtain necessary permission from the respective State Governments / UTs as per the prevailing leasing policy. The beneficiaries are required to prepare a self contained proposal indicating techno financial details together with documentary evidence of necessary permission and technical knowhow. Governmental financial assistance is restricted to 5 cages for individual farmer/beneficiary; and in case of groups of fishers /societies the assistance will be limited to 2x number of members of such groups with a ceiling of 50 cages per group. The proposal is to be routed through the concerned State Govt/UT Administration with clear recommendations. Detailed guidelines in respect of CSS have been uploaded in this Department's website [www.dof.gov.in](http://www.dof.gov.in) and [www.nfdb.gov.in](http://www.nfdb.gov.in).





# Success Story of the Rupaibali Beel Fisheries Development in Assam



Rupaibali Beel is an oxbow shaped elongated beel of 92 Ha, situated at Binnakandi Block at Cachar district of Assam. The Beel is having seasonal connection with the river Barak. There are two fishermen villages in the vicinity, Hazarigram mostly dominated by SC fisher community and Hatirhar village dominated by Maimal community. Their livelihood is solely dependent on the Beel fisheries. With the course of time, the Beel got infested with macrophytes and productivity was reduced to 94.14 kg/Ha which affected the income generation of the communities. Hence, this Beel was considered for Wetland Development by Assam Fisheries Development Corporation (AFDC) with the financial assistance of Dept of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying through the National Fisheries

Development Board. The Beel was leased for 7 years to M/s Chatla Anchalik Fishermen Association. The “Community Based Development & Management of Rupaibali Beel, Cachar, Assam” was sanctioned for an amount of Rs.33.712 lakh with 80% of Central assistance in the FY 2018-19 under the Blue Revolution scheme.

The Community was given hands on training for sensitising and confidence building for Wetland Development. The Beel was cleared by removing the weeds/macrophytes by involving the fisher community. Rearing Tank of an area of 0.40 Ha was constructed, 15 nos. of GI Cages (with effective water volume of 36 m<sup>3</sup>) were installed and also 3 units of Pen with an area of 0.60 Ha (0.20 Ha/Pen) were installed.

Once the Beel was made ready for stocking, in July, 2019, The fisher folk stocked 1.60 lakh of fish fry in the rearing tank, 2.40 lakh in Pens and 0.81 lakh/ cage with the input assistance (Fish seed, feed, fertilisers, manures) from AFDC. After 3 months of rearing 1,82,400 nos. of fish fingerlings were harvested from the rearing tank and pen with survival rate of 45% and average size of 10-15 cm and the same was released in the Beel for enhancing the fish production. From Cages, a total of 5248.8 kg was harvested with 90-100 g average weight and was sold at fingerling stage.

The marketing of the fish was done by the transportation facilities provided by the Department of Fisheries under the Blue Revolution scheme. Subsequently, 3-wheelers and transportation van were assisted to the society under the Blue Revolution scheme which is helping them in marketing fish in fresh/live condition from landing centre to the nearby market. This facility has helped them in curtailing the time consumed for transportation before and also 50% of the monetary benefitted the traders as live fish fetches higher price. Now The community is culturing the fish and selling fish directly in the market without the involvement of middlemen and consumers are also getting fresh/live fish at lower price.



The project has benefited 51 nos. of fisher families associated with the society. The production from the Beel has increased to 650 kg/Ha from the earlier production level also of 97 kg/Ha after intervention of the project. The gross income of Rs.45.50 lakh was achieved from the sale of fish @Rs.100/kg. The production from cage was 5248.8 kg which was sold at Rs.80/kg fingerling and achieved a gross income of Rs.4.199 lakh.

# Success Story of Fish Farmers, Jharkhand

**Background:** The economical condition was very poor before entering in this profession (fish culture). Earlier he was involved in sale of vegetables. He purchased the vegetables from the farmers around the Palkot and transported to Gumla and Rourkella by bus and train. He had to face many obstacles during transport and was also abused by public.

He came in touch with the fisheries department for irrigation purpose. The District Fisheries Officer motivated him and send for State level training at Ranchi. Mean while he joined as Matsya Mitra.



He took the govt. and pvt. pond on lease. He started fish culture scientifically He got more profit with less effort. Gradually he developed himself as a seed grower and started rearing fingerlings and yearlings. The tanks were stocking with yearling gave him encouraging average fish production of 3000 kg/ha/yr.

**Training:** He got State level training at Ranchi. He was also sent to Andhra Pradesh to visit Fish Farms. He also got training for fish seed production, Hatchery management. He also attended several workshops at state level as well as national level. The fisheries department also convergence him with dairy as Integrated fish farming approach. After getting training he motivated local people in fish farming and formed a fishermen cooperative society.

**Activity:** He also started natural breeding of Indigenous Magur (*Clarius batrachus*). Scientists from several Institutes came to visit his farm and studied natural breeding of magur. For this activity he was awarded by CIFE, Mumbai on National Fisherman Day on 2009.

He also established a dairy farm, where about 100 cross breed cows are available and daily 1500 liter milk is being produced. Dairy products like Curd, Paneer, sweets etc are also prepared and marketed as a brand Hindustan Dairy.

**Different Stages of Implementation of Project:** First of all he started composite fish culture then extended his business in seed production. He also cultured Freshwater prawn and Catfish culture. He has established a Modern Fish Seed Hatchery with the help of Department of fisheries. He started raising of yearling on the pattern of Andhra Pradesh. In his farm, fish seed are available throughout year. He started integrated fish farming with Dairy. He also supported to the department by providing fish seed for stocking in Reservoirs.

**Annual Achievement in Fisheries sector:** Raising of Fish fry - 80 lakhs | Production of fingerling- 60 thousand  
Production of yearling- 90 thousand | Production of fish - 10 tons | Annual Turn over - 20 lakhs

**The working Capital of the project:** The Govt. ponds were given through fishermen cooperative societies. From Department he got fish seed, feed, fry catching net and technical support on subsidized rate. The department has supported to establish Fish Seed Hatchery.

**Benefits accrue from Project and future plan:** Now a days it has been developed as an Integrated fish farming which is quite beneficial for the fish culturist of Gumla District which is dominated by tribes. Many of the farmers and officials of state and other states visited his farm. He wants to start monoculture of Jayanti Rohu in future and to establish ideal integrated fish farm and develop as a farm school.

**Background:** By birth he is a fisherman. His father came from Chapra village to Saraikela and started business as fish seed seller. Later on he was in contract with fisheries department and the District Fisheries Officer motivated him and send for State level training at Ranchi where he got training of Matsya Mitra.

After training he took the govt. and private ponds on lease. He started fish culture scientifically. Gradually he developed himself as a skilled seed grower and raised fingerlings and yearlings. The tanks were stocked with yearling and got average fish production about 3100 kg/ha.



**Machaliwale Krishna**

**Training:** He got State level training at Ranchi. He also got training for fish seed production, Hatchery management. He also attained several programme/workshop at state level as well as national level. He was also sent to Andhra Pradesh to visit Fish Farms.. After getting training he motivated local people in fish farming and formed a fishermen cooperative society. He organized and engaged several schedule tribe fisherman in fisheries activities and generated employment in fisheries sector in rural areas especially in remote areas.

**Activity:** He also started Pangassius fish culture in Jharkhand with the help of department. He also cultured various species of fish like bhetki and rupchanda, which is costly fish rather than general spp. He was awarded by CIFE, Mumbai on National Fisherman Day on 2009 for their innovative practices in fisheries sector.

**Different Stages of Implementation of Project:** First of all he started selling fish seed purchased from Bankura (WB) with father and after special training of fish seed production he extended his business in seed production in large scale. He has established a Modern Fish Seed Hatchery with the help of Department of fisheries. He started raising of yearling on the pattern of Andhra Pradesh. In his farm fish seed are available throughout year. He started feed based fish culture first time in Jharkhand and became a training spot for fish culturist and officials.

**Annual Achievement in Fisheries sector:** Raising of Fish fry - 150 lakhs | Production of fingerling- 40 lakhs | Production of yearling- 2 lakhs | Production of fish - 50 tons | Annual Turn over - 30 lakhs

**The working Capital of the project:** The Govt. ponds were given through fishermen cooperative societies. From Department he got fish seed, feed, fry catching net and technical support on subsidized rate. The department has supported to establish Fish Seed Hatchery. He also started business of Crafts, Gears and fish feed.

**The economics of the Running project:** Water area – 20 acre for fisheries activity | Fish Hatchery Unit – 3 crore

**Benefits from Project and future plan:** This district is dominated by schedule tribe population, he is famous as a successful fish culturist in Saraikela dist and now he is a role model for local fish farmer. Many of the farmers and officials of state and other states visited his farm. He wants to document the biodiversity of fish fauna of rivers of Jharkhand State. He also wants to extend fisheries technology through Kishan Gosthi.

**Background:** By birth he is a fisherman. He cultured fish since long time but not scientifically. He got training at state level training center, Ranchi.

He has private ponds, taken on lease having water area of 17 acres. He started fish culture scientifically. Gradually he developed himself as a skilled fisherman. He stocked fish fry/fingerling of various species like rohu, catla, mrigal, silver carp, grass carp, common carp in large scale. He also introduced new species like pangassius and chital. Chital is highly priced fish having Rs. 600-800/- per kg. He does regular fishing in the pond as per daily demand.



**Anokhe machali palak  
Gangadhar Ji**

**Training:** He got State level training at Ranchi. He organized and engaged several schedule tribe fisherman in fisheries activities and generated employment in fisheries sector in rural areas.

**Activity:** He also started Chital fish culture as experiment basis. He found that the chital attained 4-5 kg body weight in one and half year. It is noticeable that this species on the verge of extinction as declared by IUCN based CAMP workshop 1998.



**Different Stages of Implementation of Project:** Technical support has been given by the department regularly as per need.

**Annual Achievement in Fisheries sector:** Production of fish - 15 tons | Annual Turn over - 15 lakhs

**The working Capital of the project:** He has also started fish culture in other ponds located at Dalima (Bahragora) and Saraikela and in Orissa also.

**The economics of the Running project:** Water area – 20 acre for fisheries activity

**Benefits accrue from Project and future plan:** This district is dominated by schedule tribe population, he is famous as a successful fish culturist in Saraikela dist and now he is a role model for local fish farmer how to earn handsome amount of money through selling the fish daily. Many of the farmers and officials of state and out of the state visited his farm.

**Background:** By birth he is a fisherman. His father came from Jikorhati village near by Pakur and started business as fish seed seller. From childhood he went to his Maternal Uncle at Burdhan for learning breeding and seed production of IMC. Later on he joined with fisheries department and got State level training at Ranchi after two-three years he became Matsya Mitra (MM). He also joined as a member of cooperative society in year 1990 and became president of the society in 2001.

After training he took the govt. and private ponds on lease. He started fish culture scientifically. Gradually he developed himself as a skilled seed grower and raised fingerlings and yearlings. The tanks were stocked with yearling and got average fish production about 4000 kg/ha.



**Training:** He got State level training at Ranchi, where he trained for fish seed production and Hatchery management. He also attended several programme /workshop at state level as well as national level. He was also sent to Andhra Pradesh to visit Fish Farms. After getting training he motivated local people in fish farming and insisted them to become a member of cooperative society. He organized and engaged several schedule cast fisherman in fisheries activities and generated employment in fisheries sector in rural areas.

**Activity:** He is doing mainly fish culture and seed production. He took the govt. ponds as well as private ponds on lease for fish culture. For his contribution in fisheries, he was awarded by CIFE, Mumbai on National Fisherman Day on 2009

**Different Stages of Implementation of Project:** Initially he started selling fish seed purchased from Burdhan (WB) with his maternal uncle and after getting special training of fish seed production he extended his business in seed production in large scale. He has established a Modern Fish Seed Hatchery with the help of Department of Fisheries. He started raising of yearling on the pattern of Andhra Pradesh. Now in his farm fish seed are available throughout year. He sales his seed to Pakur, Amrapara, Litti para, Maheshpur, Pakuria, Dhulian, Dumka in Jharkhand and Naihati, Rampurhat in West Bengal.

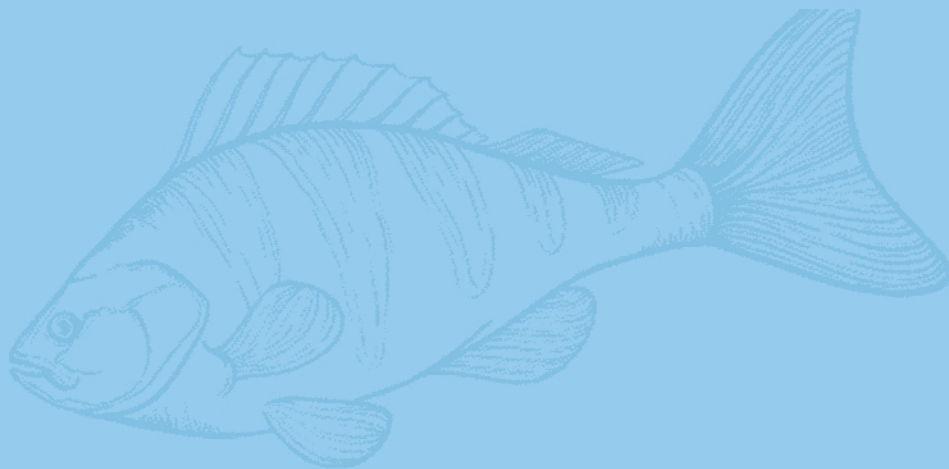
**Annual Achievement in Fisheries sector:** Raising of Fish fry - 70 lakhs | Production of fingerling- 30 lakhs | Production of yearling- 2 lakhs | Production of fish - 50 tons | Annual Turn over - 30-40 lakhs

**The working Capital of the project:** The Govt. ponds were given through fishermen cooperative societies. From Department he got fish seed, feed, fry catching net and technical support on subsidized rate. The department has supported to establish Fish Seed Hatchery. His society also gets a Pick Up van for transporting fish and fish seed. He also got speller machine from the department for procuring oil and cake.

**The economics of the Running project:** Water area – 80 acre for fisheries activity | Fish Hatchery Unit – 3 Crore capacity

**Benefits accrue from Project and future plan:** This district is dominated by schedule tribe population, he is famous as a successful fish culturist in Pakur district and now he is a role model for local fish farmer. He conducted several Kishan Gosthi in the district. He wants to breed new species like *Pabda*, *Magur*, *Singhi* and *Pangassius* and explore to new dimension in fisheries.





Department of Fisheries  
Ministry of Fisheries, Animal Husbandry & Dairying  
Government of India

Available at [www.dof.gov.in](http://www.dof.gov.in)