

Draft National Policy on Mariculture 2018 (NPM) - 19.09.2018

1. Preamble

The goal of a National Policy on Mariculture (NPM), 2018 is to ensure sustainable farmed seafood production for the benefit of food and nutritional security of the Nation and to provide additional livelihood options to the coastal communities for a better living. The overall strategy of NPM is to increase seafood production in a sustainable manner, ensure socio-economic development, enhance food, health and nutritional security and safeguard gender, social equity and environment.

Recognising that the demand for seafood is increasing year after year

Knowing that additional seafood requirement of the country in future years cannot be met by capture fisheries and inland aquaculture alone.

Recognizing that to enhance the living conditions of coastal fishermen, additional livelihood options are needed

Recognising that sea farming sector is still in its infancy in the country

Realising that there is an immense potential for sea farming in the country

Noting that there are many mariculture technologies developed in the country which can be commercialised

Bearing in mind that mariculture has already contributed to substantial seafood production sector in many countries and is growing.

The NPM has been drafted with the following Vision and Mission for farmed seafood production in the country.

2. Vision

A sustainable mariculture sector that contributes to the food and nutritional security of the country and enhancing the quality of life of the stakeholders.

3. Mission

The policy framework will lead to wide spread adoption of mariculture technologies to meet the additional seafood demand while ensuring the environmental sustainability, socio-economic upliftment of stakeholders and guide the emergence, development, co-ordination and management of mariculture production in the country.

4. Definition and Scope

Mariculture is a specialised branch of aquaculture involving the cultivation of economically important marine plants and animals in the sea or any other water body having tidal influence and includes onshore facilities like hatcheries, nursery rearing and grow out systems using seawater.

Mariculture involves three phases using the following types of facilities in land or in the sea and distinct skill sets:

- (i) *Hatchery* which involves land-based facilities to rear broodstock and produce seeds.
- (ii) *Nursery* which involves rearing of juveniles to a size conducive to stocking in the grow-out systems which are land based or inshore and
- (iii) *Grow-out* which Includes culture of marine plants and animals in the sea, water bodies with tidal influence and land based RAS systems using seawater.

Besides conventional mariculture, using the same type of facilities and skill sets, other activities that can be promoted are (i) Culture Based Fisheries (CBF) which is the practice to enhance fish stocks in waters that do not have enough natural recruitment to sustain a fishery (ii) Capture Based Aquaculture (CBA) which is the practice of collecting “seed” material from the wild, and growing to marketable size in captivity, using aquaculture techniques (iii) Conservation Mariculture which is the practice of stock enhancement of endangered, threatened and protected (ETP) species and depleted marine fish stocks for replenishment and (iv) farming of non-food species such as microbes, micro algae for extraction of bioactive compounds, biomarkers, biofuels, biochemicals, nutraceuticals and natural growth promoters. Along with mariculture, CBF, CBA, conservation mariculture and farming of non-food species need to be promoted.

5. Status and Opportunities of Mariculture in India

Globally, aquaculture has emerged as the fastest growing food production sector with an annual growth rate of >6% in the last two decades. It has increased from <1 million tonnes in 1950 to 80.0 million tonnes in 2016. In India, inland aquaculture has emerged as a fast growing sector and it has shown steady growth over the years and has become a viable alternative to declining capture fisheries. It started at a modest production of 0.75 million tonnes in 1951 and reached 4.9 million tonnes in 2017 and India is the third largest producer in the world. Similarly, coastal shrimp aquaculture production has grown steadily and crossed 5.0 lakh tonnes in the last couple of years.

Mariculture is the fastest growing subsector of aquaculture and has very high growth potential. In 2016 mariculture contributed around 28.7 million tonnes of food fish which formed about 35.8% of the global food fish aquaculture

production. The total mariculture production including seaweeds was 58.7 million tonnes, which constituted 53.4% of the total aquaculture production during 2016.

It is evident that mariculture presents a great opportunity for increasing seafood production in the face of growing demand for marine protein and limited scope for expanding wild fishery harvests. It has been estimated at a global level that the development potential for mariculture far exceeds the space required to meet the foreseeable seafood demand. The current total landings of all wild-capture fisheries could be produced using less than 0.015% of the global ocean area. The projected mariculture production based on area available in the Indian Region is 8 to 16 million tonnes whereas the current mariculture production is less than-0.05 million tonne. The success in the development of inland and brackishwater aquaculture in India also corroborates with the prospects of the emergence of a mariculture production sector. In addition, the development of a mariculture sector also strengthens the Blue Revolution policy of GOI.

Mariculture activities in India were initiated by the research and development made by Central Marine Fisheries Research Institute (ICAR-CMFRI) in the early 1980s leading to the initiation of small scale commercial practices by the 1990s. NIOT and the MPEDA have also significantly contributed to the development of mariculture. Currently, the mariculture production is modest and the available technologies include seed production and farming of finfishes (cobia, pompano, sea bass, groupers, snappers, breams and ornamental fishes) shell fishes (mussels, oysters, clams, lobsters, green tiger shrimp, blue swimmer crab, ornamental shrimps) and seaweeds. Technologies for IMTA, RAS, live feeds and marine pearl production are also available in the country. Commercial farming of mussels, oysters, seaweeds and few finfishes is already in place.

The marine capture fisheries in India is characterised by increased and excessive fishing effort, overexploitation of certain resources from the inshore fishing grounds and increased conflicts among different stakeholders in the sector. It is stated in the National Policy on Marine Fisheries 2017 (NPMF) that “A Working Group (WG) set up by the government in 2011 for the assessment of fish stocks in the Indian EEZ indicated overcapacity in the territorial waters with respect to different categories of mechanised fishing vessels for all maritime states/Union Territories and suggested an optimum fleet size for consideration of the Government”. The Government will consider the suggestions contained in the report of the WG and develop strategies to reduce overcapacity and implement the same in a phased manner in consultation with the States/Union Territories and other concerned stakeholders.

India needs to produce about 18 million tonnes of fish by 2030 as compared to the 10 million tonnes that we produce through capture and culture today. This would necessitate increasing our aquaculture production from about 4.9 million tonnes now to 12 million tonnes. Hence, steps for the emergence of a mariculture production sector is the only option for meeting the demand for fish in the coming years. Considering this it is stated in the NPMF 2017 that “Mariculture if carried out can play an important role in increasing fish production from the coastal waters. Government will encourage schemes to set up mariculture farms /parks and setting up hatcheries for supply of seed for the development of the sector. Institutional and commercial needs of this emerging sector, which will include leasing rights policies, spatial planning, technological inputs such as husbandry, seed, feed, health management, environmental and social impacts, capacity building of local fishers and local entrepreneurs to take up mariculture; and development of local markets and value chains will be addressed in consultation with coastal states/UTs and concerned stakeholders. Participation of small fishing communities, fishermen groups, fishery co-operatives or government organisations will be specifically encouraged and supported.” Therefore, it is the need of the hour to formulate a policy for guiding the development of mariculture in India.

6. Objectives

1. To enhance mariculture production in the country and increase income and employment opportunities in a sustainable manner.
2. To promote entrepreneurship in mariculture by facilitating the technical and financial inputs.
3. To adopt an environmentally sustainable approach for development of mariculture.

7. Mariculture Area Development

- 7.1. Suitable sites will be demarcated for different mariculture activities such as cage farming, bivalve farming, pen culture, seaweed culture, hatcheries and nurseries based on scientific criteria including the socio-cultural attributes and other logistics. Such areas will be earmarked as mariculture zones, in consultation with all stakeholders not limited to fishers but also include coastal dwellers, and relevant arms of State and Central government departments.
- 7.2. The potential zones for mariculture development will be identified based on criteria developed through scientific evaluation of environmental parameters suitable for the type of farming, negligible impact on environment, avoiding conflict with other users, protecting livelihoods of local fishing communities and their access to fishing grounds. Satellite remote sensing data and GIS will be employed to provide essential tools to support. After identification,

potential areas for mariculture will be finalised based on inputs from stakeholder consultations.

- 7.3. Areas identified in the above manner will be designated as mariculture technology parks by the respective states. Necessary protection and logistic support will be provided for mariculture activities.
- 7.4. Marine Spatial Planning (MSP) will be employed for data management, analysis, modelling and decision making taking cognizance of CRZ zoning. All the government agencies concerned will join together to create a planning document on different mariculture sites in India.
- 7.5. Such mariculture zones earmarked in the inshore/coastal areas shall exclude MPAs, ecologically sensitive areas like coral reefs, mangroves, seagrass beds, and other coastal areas with strategic interest. Navigational channels and fishing grounds will be excluded.
- 7.6. Government shall encourage the setting up of off-shore technology parks and coastal embankment systems with all support infrastructure for breeding, culture, packaging and trade.

8. Leasing Policy

- 8.1 Mariculture is generally practiced in the sea up to 12 nm from the coast and also in water bodies which have a salinity regime close to seawater. As per Article 21 of the Indian Constitution the States are empowered to regulate and manage marine fisheries and allied activities which includes mariculture. The provisions made in the 73rd and 74th amendments to the Constitution of India empower the panchayats to perform functions mentioned in the eleventh schedule of the Constitution in 29 subjects including fisheries with regard to inland water bodies and therefore, rules for leasing water bodies for mariculture will be made by LSGs.
- 8.2 The guiding principles in developing mariculture activities in open access water bodies would be public trust responsibility where, care would be taken to prevent conflicts among other users such as fishers and navigational users; ensure limits to biological production based on carrying capacity; integrate principles of sustainability to mariculture by limiting impacts on the environment and society; promote conservation of marine habitats and protection of rights of those carrying out mariculture.
- 8.3 All mariculture farms in the sea would operate only in an area leased out for the purpose by the respective maritime States. Besides, the State would register and license all farms for a specific period and will give all protection of all farm assets.

8.4 In the case of natural water bodies, the leases would be given by respective Local Self Governments (LSGs). All leases would be founded on advisories of research and development institutes with respect to the area limits based on suitability of the water bodies for the farmed species. There would be close liaison between the LSGs and State Fisheries Departments/UTs in this regard.

9. Mariculture Systems and Species

9.1. Mariculture systems currently in use are different types of cages, longlines, rafts, racks, pens, raceways, Recirculating Aquaculture Systems (RAS) and Integrated Multi Trophic Aquaculture (IMTA). Major focus will be given for the improvement of existing technologies to be on par with international standards, biosecurity and code of practices.

9.2. New aquaculture systems will be promoted in identified areas after their farm level validation.

9.3. All native food and non-food marine species having mariculture potential will be promoted.

9.4. In view of the higher risk of escapees from the culture systems in use and their likely establishment in wild, exotic and GM species will not be allowed for open sea culture but can be considered in closed mariculture systems after stringent risk assessment and monitoring.

9.5. Diversification of species will be encouraged based on site suitability, availability of technology, demand and commercial feasibility, ecological impacts, social and economic benefits, etc.

9.6. Marine ornamentals have significant market globally. Considering the risk of over-exploitation of wild ornamental species, hatchery production of ornamental species for which technologies are available, will be promoted. Special schemes would be drawn to establish marine ornamental sector. Appropriate mechanism will be put in place to detect, pre-empt and regulate trade of wild-caught ornamentals as cultured ones.

10. Precautionary Approach to Environmental sustainability

10.1. According to the FAO, an ecosystem approach to aquaculture (EAA) is a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity and resilience of interlinked social-ecological systems. When applied to mariculture, these are also to be in conformity with article 9 of the FAO-CCRF.

- 10.2. Incorporating the principles of ecosystem approach in mariculture would promote a process of enhanced sectoral management at different scales, taking into account environmental limits and the interests of other users and stakeholders. It will aim to improve human well-being and equity for all stakeholders and mariculture will be developed in alignment with other crosscutting sectors, policies and acts.
- 10.3. Mariculture development and management will take into account the full range of ecosystem functions and services and would not threaten the sustained delivery of these to the society.
- 10.4. Necessary procedures for assessment and monitoring of the ecological and social impacts of water use, effluent discharge, use of drugs and chemicals and other mariculture activities will be put in place.
- 10.5. In order to tap export markets and ensure food safety for the domestic markets, farmed bivalves require to meet strict quality criteria with respect to microbial, heavy metal and other pollutants in the growing water bodies. Major bivalve farming regions will be continuously monitored to meet the growing waters quality criteria set by the EU and NSSP (of the USA) and certified by the Export Inspection Agency.

11. Seed and Feed

- 11.1. Ensuring availability of seed material for the targeted mariculture species is critical to sustain the momentum of proposed expansion of mariculture sector in the country. Innovative schemes will be developed for establishing hatcheries, seed farms, rearing units and SPF/SPR/genetically improved brood banks.
- 11.2. Schemes will be taken up for attracting entrepreneurs to start establishing finfish /shellfish hatcheries and nursery units.
- 11.3. Centres for the supply of fresh stock of fragments and import of germplasm of sea weeds after necessary quarantine will be set up.
- 11.4. A system of seed certification would be developed by agencies concerned in order ensure supply of quality seed.
- 11.5. Research institutes have developed seed production technologies for few commercially valuable finfish and shellfish species. However, these technologies need to be scaled up to cater to the production system. In order to achieve this, the government (central, state & developmental agencies) has to promote large & satellite hatcheries and nurseries for seed production either on PPP or private modes or by co-operatives.

- 11.6. To increase seed availability for mariculture species, schemes will be developed to upgrade / modify existing shrimp hatcheries and construct new facilities by providing financial support.
- 11.7. To make seeds of new candidate species available to farmers, financial support to be extended for new hatcheries and farmers co-operatives.
- 11.8. Availability of stockable size fingerlings for farming to be assured through establishment of nursery rearing in indoor facilities and earthen ponds to be promoted.
- 11.9. Currently farmed bivalve production is entirely dependent on seeds collected from the wild, and this has become a limiting factor in the expansion of production. Technologies for bivalve seed production have already been developed by research institutions. Financial and technical backstopping would be provided to establish bivalve hatcheries in major bivalve growing areas.
- 11.10. Since seed production technologies of many species are either not standardised or commercially viable, the practice of CBA will be permitted with regulations and proper management to ensure the sustainability of the wild stocks of the concerned species.
- 11.11. In implementing conservation mariculture, care should be taken to ensure that the natural genetic variability is not altered through sea ranching operations of hatchery raised seed.
- 11.12. Taking into account the policy of the Government of India (NPMF, 2017) to control the use of lower trophic level food fishes as source of fish meal; the expansion of mariculture activities in India and its feed requirements, will promote sourcing alternate, sustainably caught fish species for fish meal in location-specific feed-mills of appropriate capacity, through public/ private/ corporate bodies.
- 11.13. Feed quality standards are available only for shrimp and Indian major carps (IMC). Marine fish feed standards have to be developed for the growth of mariculture with inputs from research institutions.
- 11.14. The Government will also evolve guidelines for use of feed ingredients based on local availability, mineral mixture and other nutrient supplements, based on the research advancements made by national and state level research and academic institutions. Government will also promote use of fishmeal from certified sustainable fisheries.

- 11.15. To ensure the availability of cost effective feed for new candidate species, the existing aquafeed mills and establishment of new units will be supported to manufacture marine finfish feeds.
- 11.16. A mechanism will be put in place for testing the quality of the formulated feeds and to ensure their traceability.
- 11.17. Utilization of low value fishes for alternative feed for the candidate species need to be restricted to a sustainable level and should be allowed only till the development of a standard artificial feed.
- 11.18. Quality of the finished feed and traceability of the feed stuffs used has to be ensured so that eco-labelling of suitable mariculture production systems will be promoted to ensure premium prices for such produce.
- 11.19. With the demand for marine fish feeds, which is expected to rise with the promotion of mariculture, Government would draw inputs from research institutions to develop feed quality standards.
- 11.20. Replacement of fish meal with other protein sources of plant and animal origin will be explored for reducing the cost of feed.

12. Food Safety and Health Management

- 12.1. Traceability and record-keeping of farming activities and inputs which impact food safety would be ensured by documenting the source of inputs such as feed, seed, permitted veterinary drugs and antibiotics, additives, chemicals; type, concentration, dosage, method of administration and the rationale for their use.
- 12.2. Mariculture activities would be conducted in a manner that ensures food safety by implementing appropriate national (FSSAI) or international standards and regulations including those defined by FAO/WHO *Codex Alimentarius*.
- 12.3. Mariculture operations would implement aquatic animal health management programmes set up in compliance with relevant national legislation and regulations, taking into account the FAO CCRF Technical Guidelines on Health Management for Responsible Movement of Live Aquatic Animals and relevant OIE standards.
- 12.4. To reduce the risks of introduction and spread of aquatic animal diseases, species specific Good Aquaculture Practices (GAPs) would be developed and implemented. Use of species in polyculture or IMTA should be carefully

considered in order to reduce potential disease transmission between cultured species.

- 12.5. Veterinary medicines would be used in accordance with applicable national legislation or relevant international agreements that ensure effectiveness, safety of public and animal health and protection of the environment.

13. Capacity Building and Extension

- 13.1. The Government will introduce new schemes for enhancing the skills and capabilities of the traditional fishers and other potential stakeholders to undertake mariculture and popularize the vocation in India.
- 13.2. The government will facilitate formation of mariculture cooperatives through skill development and technical /financial support, wherever necessary.
- 13.3. Recognizing the active role of coastal women and enterprising family members of the coastal fishers in taking up mariculture of oysters, mussel and seaweeds in South India, and demonstrating the potential of mariculture for alternative income and social empowerment, financial and technical support will be provided for these activities.
- 13.4. Planned and concerted effort will be undertaken under the aegis of Skill India Mission, in order to develop adequate manpower with necessary skills and entrepreneurship to meet the skilled manpower requirements for the potentially expanding sector.
- 13.5. A tailor-made capacity building module will be developed involving the Agriculture Skill Council of India (ASCI) and other expert academic bodies to impart core knowledge related to the mariculture operations and governance to functionaries of the fisheries department from the coastal states and UTs.
- 13.6. In order to provide thrust and impetus to new candidate species/technologies /areas for mariculture, frontline participatory demonstrations will be taken up with full financial support and handholding till it is getting established.

14. Ecolabelling and Certification

- 14.1. Globally, voluntary sustainability standards (VSS) are becoming very important in the drive for ensuring sustainable seafood production. In aquaculture, two standards which are compliant to FAO and ISEAL are the Aquaculture Stewardship Council (ASC) and the Global Aquaculture Alliance (GAA). India's competitiveness in the global seafood market is largely dependent on meeting these standards. Efforts will be made towards this.

- 14.2. The Aquaculture/Mariculture Acts of the maritime states will be amended to include the provisions of the VSS in order to ensure sustainability.

15. Insurance and Financial Support

- 15.1. Mariculture, is an emerging sector that requires considerable investment from prospective entrepreneurs, and requires institutional support in the form of credit or subsidies for its development. The government will formulate special financial assistance programmes for promotion of mariculture with due participation of financial institutions and developmental agencies. This would include prioritized lending schemes, subsidized credit and investment subsidies with liberal terms and conditions that can absorb establishment and operational costs.
- 15.2. Mariculture activities are susceptible to the risks of natural calamities and anthropogenic activities. Currently, there are no substantial initiatives from the insurance industry to cover these risks and those customized products available are with highly prohibitive premium rates. The government will introduce suitable insurance schemes to plug this gap and would encourage private insurance companies to develop insurance solutions for the sector.
- 15.3. In view of the long gestation period and high investments required for cultured marine pearls adequate financial support including low interest loans will be offered to entrepreneurs.
- 15.4. Technological interventions such as geo-spatial tools and protocols for mapping damages and interactive ICT tools and mobile applications for real-time damage assessment and quick processing of insurance claims, would be considered.
- 15.5. To make the products more affordable, premium subvention programmes will be floated for small-scale operators.
- 15.6. Personal/group insurance schemes will be extended to cover life/accident risks of personnel involved in mariculture activities.

16. Market support

- 16.1. Efficient market logistics would be promoted to minimize post-harvest losses and preserving the nutritional quality and value of fish.
- 16.2. The existing capacity of processing infrastructure in the exporting units in the country would be harnessed for developing frozen, live, chilled and value added products suiting both domestic and export sectors.

- 16.3. In order to increase the domestic consumption of bivalves and seaweeds, promotional schemes highlighting their health benefits would be introduced.
- 16.4. Institutional support will be extended for development of domestic market infrastructure for hygienic handling, processing and cold storage.
- 16.5. Cost-effective preservation and packaging facilities will be developed through public-private partnerships.
- 16.6. Appropriate measures would be taken for product diversification, branding, certification and for strengthening market intelligence.
- 16.7. Financial assistance, capacity building, technical guidance and institutional support will be extended to stakeholders involved in the mariculture value chains.
- 16.8. Marketing of fish through institutional sales channels or online web portals will be encouraged for reducing the exploitation by intermediaries.

17. Institutional Mechanisms

- 17.1. Mariculture is a component of marine fisheries that comes largely under the DADF, other Central Ministries, the coastal states, the UTs, and the CAA. The Ministry of Earth Sciences and the Ministry of Science and Technology have significant roles in technology development. The experience in bringing about a significant growth of freshwater aquaculture production in the country is useful in embarking on a major expansion of mariculture in the country. These agencies should work closely and in a synchronised manner to promote mariculture.
- 17.2. The DADF will be a prime mover in providing support to the new initiatives in mariculture. The NFDB, along with financial institutions are expected to design new packages for expansion of Mariculture. It is also essential to leverage support from private financial institutions for rapid expansion of mariculture.
- 17.3. Models for Environment Impact Assessment (EIA) will be developed by R&D institutions. In mariculture species health management, early diagnostics and tested remedial measures will be put in place. The role of the ICAR research institutes, Ministry of Science and Technology, and the universities will be dovetailed for all of the above and for productivity enhancement.
- 17.4. Engineering aspects of mariculture, such as development of large scale mooring systems, designing of durable and low cost cages will receive R&D support from agencies concerned. Mapping of suitable areas for taking up mariculture will be

done and a road map prepared for phase wise expansion of mariculture to reach the targeted production.

- 17.5. Since a major portion of the increased fish production necessary to meet future demands is expected to come from mariculture there will be a major operation involving the deployment of huge resources in terms of infrastructure, manpower and effective coordination with all coastal states/UTs. As this effort cannot be handled as an add-on activity of any agency or department, a separate Task Force involving the participation of all agencies involved may be created. This should be evolved into a separate implementing agency that will be created to bring together all agencies and steer the activities for rapid expansion of mariculture to meet country's fish production targets.
- 17.6. There will also be a multi-agency committee of the Central Government, coastal states, UTs, NGOs and other stakeholders to ensure that all legislations are synchronised for the promotion of mariculture.
- 17.7. Since CBA is an interface between capture fisheries and mariculture, its potential to provide an alternative livelihood for local coastal communities needs to be promoted through appropriate institutional arrangements.
- 17.8. The state and central governments will develop guidelines through the establishment of conducive institutional arrangements that allow regulation of use and a flow of benefits to those who bear the costs of enhancement, and to manage environmental and other impacts on and arising from stock enhancements.
- 17.9. Effective monitoring of mariculture activities will require a paradigm shift in the extent of skill and inter-departmental coordination required, given its location, issues in access, etc. An appropriate coordination mechanism will be evolved that involves Departments of Fisheries of the maritime States/UTs, Coastal Marine Police, Indian Coast Guard (ICG), etc. An institutional mechanism for interaction of all stakeholders including the coastal community and fishers will be established.
- 17.10. Effective monitoring is vital for developing mariculture in a regulated manner. There are many examples of unregulated aquaculture development leading to ecological and social crisis. The appropriate legal and administrative framework which facilitates the development of responsible mariculture vests with the respective maritime states. The aquaculture/mariculture acts of the maritime states would contain provisions for monitoring and control of mariculture activities.

18. Legal Frame Work

- 18.1. The state legislatures have the power to make laws and regulations with respect to a number of subject matters including land, water and fisheries. As per schedule 21 of the Indian Constitution, the States/UTs are empowered to regulate and manage marine fisheries in their territorial waters extending upto 12 nautical miles off the coastline towards the sea, and the area from 12 to 200 nautical miles in the EEZ comes under the jurisdiction of the Union Government. There are several Fisheries and Aquaculture Acts of maritime states/UTs. The Union government has enacted Coastal Aquaculture Authority Act 2005 in order to regulate coastal aquaculture in India. Further, the Central Government has a legal framework with focus on conservation of environment and biodiversity, viz., Wildlife (Protection) Act 1972 and its amendments; Environment (Protection) Act, 1986; Coastal Regulation Zone (CRZ) Notification, 2011; Environment Impact Assessment (EIA) Notification, 2005; and Biological Diversity Act, 2002 and their subsequent amendments.
- 18.2. Mariculture in India shall be promoted in consonance with the relevant national and global instruments (eg: Sustainable Development Goals-SDGs, Code of Conduct for Responsible Fisheries -CCRF and Voluntary Guidelines on Sustainable Small Scale Fisheries -VG SSF), good practices (BMPs, GAPs, etc) and other guidelines.
- 18.3. Each maritime State will have an Aquaculture/Mariculture Act guided by a set of rules to govern mariculture. Existing acts, if any, will need to be modified/amended to cover mariculture activities.
- 18.4. The Central Government is mandated to regulate the fisheries activities in the EEZ i.e. 12- 200 nautical miles where a significant portion of mariculture activities will be carried-out. These will be as per the guidelines issued by the Department of Animal Husbandry, Dairying & Fisheries (DADF), Ministry of Agriculture and Farmers Welfare (MoAFW) while that in territorial waters (upto 12 nautical miles) shall be guided by the rules of the respective coastal states/UTs.
- 18.5. In order to promote mariculture activities in the 12-200 nm zone, the central government will take steps to develop guidelines enact a new law. In the 0-12 nm zone, the respective maritime states/UTs will also take steps to bring in measures for development of mariculture based on a model Bill to be developed by the central government. This Bill would take into account relevant international/voluntary agreements, laws and standards. The maritime states/UTs which already have an aquaculture Act will modify/amend regulations to cover mariculture activities.
- 18.6. In consonance with the initiative of the Government of India for holistic development of Islands, mariculture will be made a key developmental activity apart from tourism and capture fisheries. The Government will review and

modify the existing Acts/regulations (eg. Island Protection Zone (IPZ), 2011) to enable mariculture development of the Andaman & Nicobar and Lakshadweep Group of Islands.

- 18.7. Government will make necessary amends in the extant rules to permit mariculture in selected areas with adequate safeguards to ensure that the conservation efforts are not compromised.

19. Research and Development

- 19.1. Government will facilitate institutes involved in mariculture to take up development of technologies for captive breeding and seed production of additional species (Plants & animals).
- 19.2. New and innovative farming technologies (RAS, IMTA, and polyculture) will be developed, validated and disseminated for improved mariculture production.
- 19.3. For sustainability in mariculture, cost effective larval and grow-out feeds and ingredients (fish meal & fish oil replacements) will be developed through R & D.
- 19.4. Selective breeding technologies to improve growth, disease resistance, flesh quality, aesthetic value and adaptability of species to varying environmental conditions are to be promoted.
- 19.5. Marine algae and microbes with potential for generation of non-food commercial products will be identified and technologies developed for the same and scaled up.
- 19.6. Technologies will be developed for production of heat resilient strains of seaweeds.
- 19.7. For expansion of seaweed culture, potential areas need to be identified and culture technologies for native species (edible and non-food use) should to be improved, particularly with regard to avoidance of grazing and use of fertigation.
- 19.8. Appropriate disease diagnostic kits, vaccines, SPF and SPR varieties of species will be developed to promote sustainable mariculture.
- 19.9. Development of newer technologies for post-harvest handling, value addition and marketing will be promoted.
- 19.10. Models will be developed for assessing carrying capacity in tropical waters.

- 19.11. Climate resilient mariculture species, systems and practices will be developed.
- 19.12. In bivalves, protocols for low cost depuration to meet international quality standards will be developed.
- 19.13. In order to ensure year round availability of seeds, controlled breeding units with photo thermal/ other environmental parameters and nutritional interventions will be set up.
- 19.14. Research on offshore mariculture, development of submersible cages and automation of cage operations in mariculture will be promoted.

