AQUABE 2019

Souvenir

blue ɪ'kɒnəmi

International Conference on Aquatic resources and blue economy

28-30 November 2019

Kerala University of Fisheries and Ocean Studies (KUFOS)

Panangad, Kochi-682 506, Kerala, India

www.kufos.ac.in

AQUABE 2019

Souvenir

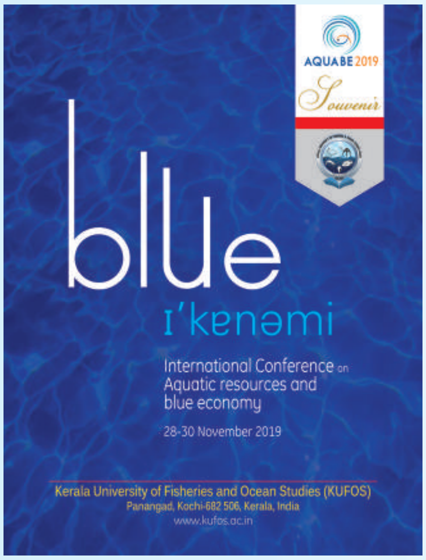
International Conference on Aquatic resources and blue economy

28-30 November 2019

Kerala University of Fisheries and Ocean Studies (KUFOS)

Panangad, Kochi-682 506, Kerala, India

www.kufos.ac.in



Chairman:
Prof. (Dr.) A. Ramachandran
Vice Chancellor, KUFOS.

Organising Secretary:
Dr. T. V. Sankar
Director of Research, KUFOS.

Published by:
Prof. (Dr.) A. Ramachandran
Vice Chancellor, KUFOS.

Compiled & Edited by:
Souvenir Committee
Dr. K. Dinesh (Chairman)
Dr. Chiranjiv Pradhan
Dr. Rachel Fernandez
Ms. Anna A.T.
Mr. Jithin K.
Mr. Amanjit Nayak
Mr. Unnikrishnan K.V.
Ms. Leena Devadas
Ms. Chandana
Ms. Lipika Hembram
Smt. Nilima Priyadarsini

November, 2019

Contents

Mariculture: an integral component of the Blue Economy

A. Gopalakrishnan and **Grinson George**
ICAR-CMFRI, Kochi-18
director.cmfri@icar.gov.in

Production from the marine capture fisheries sector of India has remained quite stable for the last decades. On average we are capable of producing only 3.5 million metric tonnes every year and there is little scope for improvement. Thus marine capture fish production of India is plateauing off, indicating that sustainable levels have been reached in a sector which has 4 million people involved directly and indirectly with it for their livelihood. But demands for sea food are soaring in the country. The projected demand for seafood in India is expected to be 18mt by 2030. To meet this demand we would require the production of an additional 7 million metric tonnes in the country. There is a possibility of a quantum jump if newer avenues of fish production through sea farming are undertaken. With marine capture fisheries showing stabilization and the freshwater aquaculture sector reaching fairly high production levels, there is little scope for a major increase from these sectors. All attention is therefore towards the sea and the various options it offers for production through mariculture of about 5 million metric tonnes of seafood annually at an estimated value of Rs 1,00,000/- crores.

Aquaculture is the fastest growing segment in the primary sector globally with annual growth of >6% in last two decades. Globally, aquaculture production increased from <1 million tons in 1950 to 80.0 million tons in 2016 of which 80% came from 20 million small-holder farms (<2 ha) in developing countries. The environmental demands for unit biomass or protein produced are lower in aquaculture as compared to poultry, piggery and beef. Grain needed for production of 1kg protein of fish is<13 kg as compared to pork with 38 kg and beef with 61 kg. Fish is a “blue” animal protein with a small carbon footprint, only 0.96% of total CO2 emission and 6.3-7.5% of agriculture emission in the country. Hence farming of fish will be of greater benefit to humanity and if it is carried out in the sea (mariculture), pressure on limited terrestrial resources can be minimized.

Mariculture is the fastest growing subsector of aquaculture. Breeding technologies are being developed for a number of marine species, thereby moving from wild caught seed to hatchery produced seed. There is high growth potential in the sector in India as this sector is getting established and is at its infancy. Mariculture, particularly cage farming is getting established all along the coastal waters of maritime states and Union Territories (UT). The unbridled passion with which mariculture scientists worked resulted in the establishment of battery of cages producing marine fishes all across the maritime states in the country. But the production from mariculture is yet to pick-up on a commercial scale in India. Rise in demand for fish produced through mariculture would not only hasten the exploration of new resources, but also contribute to greater incomes and employment for coastal communities who venture to take up this activity. .The general conceptualization on mariculture is such that, utilization of at least 1% of coastline for cage farming can meet the targets set without much hassles. There is a need for augmenting seed production of prioritized marine fish/shell fish species to provide seed supply to the fish farmers engaged in mariculture related activities. Through All India Network Project on Mariculture (AINP) and other efforts at CMFRI, we were able to produce seeds for Indian pompano, silver pompano, cobia, pink eyed emperor, Orange spotted grouper and few more. With the support of National Fisheries Development Board (NFDB) we have established a national brood bank at Mandapam and have technically supported the establishment of regional hatcheries across the peninsular coast. Diversification of species is another important area to be pondered upon. At CMFRI, we are focussed on developing technologies supporting the prioritized species for mariculture. Some major breakthrough in mariculture include, seed production and farming of cobia, silver and Indian pompano, Asian sea bass, groupers and blue swimmer crab (Portunus pelagicus). Significant strides have been made in the areas of sea cage farming, green mussel, edible oyster and clam seed production and grow out, seed production and farming of the green tiger prawn Penaeus semisulcatus, fattening protocols of spiny lobsters and crabs, seaweed farming, production in Recirculation Aquaculture Systems (RAS), and production through Integrated Multitrophic Aquaculture Systems. To complement these, technologies such as live feed production for larviculture, marine aquarium techniques, hatchery production of selected marine ornamental fishes and marine pearl production also have been developed.

Coastal activities related to the marine system such as sea weed farming, shrimp farming, cage farming of marine species are akin to innovations of the traditional kind. Sea weed farming is still viable only on contract purchase mode as the market is a specialized area where demand is soaring, but constrained by limited number of free buyer-seller groups related to sea weed. Seaweed farming (Kappaphycus alvarezii) along Ramanathapuram and Tuticorin coasts of Tamil Nadu is producing about 6000 tonnes annually. Indians are yet to develop a culinary preference for nutrient rich sew weed delicacies unlike our south East Asian and Chinese counter parts. If sea weeds are going to have dietary preference in the country, the production levels from mariculture would experience a quantum jump due to the energy efficient biomass which will be generated for domestic consumption.

With the introduction of non-native shrimp species, India’s shrimp production potential grew by leaps and bounds in the past 2-3 decades. However, intensive mode of culture has resulted in the need for a relook on the sustainability of the system. Cage farming has to be up-scaled and measures through the intervention of NFDB programmes with CMFRI technology support are appreciable. Centres propagating these techniques as well as those supplying seed material and providing advisory services are also in the same category. In fact, the development of hatcheries and seed production centres has been responsible for the rapid growth of marine fish farming in the coastal areas. The setting up of feed manufacturing units to cater to specialised requirements was another landmark change. As shrimp farming grew, incidences of diseases increased, necessitating the setting up of rapid and reliable diagnostic facilities. The setting up of sophisticated centres along the coast providing DNA based diagnostics will remain a watershed in the growth of shrimp farming in the country. These advanced diagnostics were available to shrimp farming sector perhaps even before it was available to other animal husbandry sectors in the country.

Algae as a bio-refinery is a much debated topic. There are several modern technologies which promise to chemically transform natural vegetable oils into clean-burning organically produced biofuels. In a climate challenged world, biofuels are safe for the environment, easily biodegradable and causes less air pollution than conventional fossil fuels. Oil spills in marine environment is another issue we are facing when we deal with fossil fuels. Biodiesel degrades quickly after a spill, has a high flashpoint and low volatility. It does not ignite easily as petrodiesel thereby making it safer. Biodiesel degrades four times faster than petrodiesel and is not particularly soluble in water. It is nontoxic, safe to handle and transport. Most emissions from biodiesel are significantly lower than petroleum emissions as there is no sulfur in biodiesel and consequently no sulfur dioxide emissions which are highly detrimental to health. Biodiesel reduce greenhouse gases as the CO2 available in the atmosphere is recycled unlike fossil fuels that on burning increase the levels of CO2 levels in the atmosphere.Microalgae exhibit higher photosynthetic efficiency, higher biomass production and faster growth compared to other energy crops. They can yield more biodiesel (methyl esters of fatty acids by trans esterification or alcoholysis) for a unit area of cultivation when compared to other oil crops. Production of biodiesel from marine biomass such as algae is emerging as an attractive proposition. Algal production rates can be more than 5 times that of terrestrial plants. Algal biomass is highly feasible for biodiesel production because of the high hydrocarbon content, sometimes up to 50-70% of their dry weight. Many countries have shown keen interest in the last few decades to screen various algal species for biodiesel. The U.S. Department of Energy funded a programme during 1978 and 1996 for developing renewable transportation fuels from algae. The programme, known as Aquatic Species Programme (ASP) was aimed at production of biodiesel from high lipid-containing algae grown in ponds.

There are few challenges in research and development to be taken up for the unfettered growth of mariculture in the country. Government needs to facilitate research institutes involved in mariculture to take up development of technologies for captive breeding and seed production of additional species (Plants & animals). New and innovative farming technologies (RAS, IMTA, and polyculture) have to be developed, validated and disseminated for improved mariculture production. For sustainability in mariculture, cost effective larval and grow-out feeds and ingredients such as insect meal (fish meal & fish oil replacements) need be developed through R&D. Selective breeding technologies to improve growth, disease resistance, flesh quality, aesthetic value and adaptability of species to varying environmental conditions are to be promoted. Marine algae and microbes with potential for generation of non-food commercial products have to be identified and technologies developed for the same and scaled up. Technologies are to be developed for production of heat resilient strains of seaweeds. For expansion of seaweed culture, potential areas need to be identified and culture technologies for native species (edible and non-food use) should be improved, particularly with regard to avoidance of grazing and use of fertigation. Appropriate disease diagnostic kits, vaccines, SPF and SPR varieties of species have to be developed to promote sustainable mariculture. Development of newer technologies for post-harvest handling, value addition and marketing are to be promoted. Models are to be developed for assessing carrying capacity in tropical waters. Climate resilient mariculture species, systems and practices have to be developed. In bivalves, protocols for low cost depuration to meet international quality standards are needed to be developed. In order to ensure year round availability of seeds controlled breeding units with photo thermal/other environmental parameters and nutritional interventions have to be set up. Research on offshore mariculture, development of submersible cages and automation of cage operations in mariculture are areas where substantial research focus needs to be placed.

The Government of India announced in August, 2007 a biodiesel purchase policy to replace fossil fuels in due course. The ministry has identified biodiesel procurement centers in different states. TNT, one of the world's leading express companies, has launched a pilot project in India to use biodiesel in its delivery vehicles. TNT used a 10% blend of jatropha and pongamia oils. CSMCRI, Bhavnagar is working on development of viable protocols for biofuels from jatropha. The main commodity sources for Biodiesel in India can be non-edible oils obtained from plants Jatropha curcas, Pongamia pinnata, Calophylluminophyllum, Hevcca brasiliensis, etc. Now that a biodiesel policy of the Government of India is in place, we can expect rapid developments. Efforts by Coastal Energy Limited, an Indian Public Limited Company in setting up a state of art biodiesel production plant with an annual capacity of 100,000 tons in Falta Special Economic Zone, Kolkata, West Bengal is noteworthy. Considering the vast coastal area of India (~8000 km coastline) and the immense algal biodiversity, the possibility of setting up production facilities using salt tolerant algal species is a very bright techno economically viable proposition.

The Blue Economy is a sleeping giant, but considering the growing awareness and development of instruments both in terms of investment and policies, there is a likelihood of major developments being triggered off in the sector. With the need to enhance marine fish production to meet the country's targets, attention is turning to the possibilities of embarking on a major expansion of mariculture or farming of fishes in the coastal areas and open seas. This will necessitate our readiness with the appropriate policy tools and investment measures. Accordingly, a policy for Mariculture is being drafted and this will provide a template for rapid and sustainable growth in the sector. It will be useful if a separate implementing agency is created for effectively undertaking large scale mariculture or sea farming. It may also be examined if a portion of the revenue generated from marine exports be channelized for R&D activities pertaining to Blue Economy.