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EMERGING TRENDS IN INDIAN AQUACULTURE

Leena Nair

Chairman, M P E D A, MPEDA House
Panampilly Avenue,COCHIN-682 036.
Email: leenanair@mpeda.nic.in

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It is indeed heartening to note the one of the oldest teaching-cum-research departments of the University of Kerala - The Department of Aquatic Biology and Fisheries has come forward to organize this National seminar on Emerging Trends in Indian Aquaculture 2013. The Marine Biology & Fisheries Laboratory and Aquarium, as department was formerly known was the pioneer research institution that carried out studies in the field of Fisheries and Aquaculture in India. This department was also the first in India to conduct detailed studies in breeding, feeding and culture of brackish water food fish such as mullets, milkfish & pearl-spot and also demonstrate artificial manuring of fish ponds. Established in the year 1938, this department thus served as the foundation for the emergence of several other research institutes in Fisheries and Aquaculturein the country which took forward the programmes initiated by this department.

ETIA 2013 is yet another initiative from this department that hopefully will usher in a sea change in the way academic institutions prepare the students to take up challenges that lie ahead.That too, at a very crucial juncture, when Aquaculture is poised to become the major contributor to world fisheries production, it is important that India keeps abreast with technology developments and innovations across the world, utilize its vast untapped natural resources to sustain its aquaculture production, not just to feed its growing population but also for enhanced exports.

As you are all aware, fisheries production is a combination of production both from capture fisheries as well as cultured fish. The world continues to witness the declining trend in capture fisheries production in spite of increased efforts at conservation. The trend in India too is no different with landings becoming stagnant and declining at times. Aquaculture has now emerged as the main way forward in sustaining fisheries production and augmenting fishery resources through increase in farming area as well as development of innovative farming practices. The share of Aquaculture in the total world fisheries production rose from 29.8% of total fisheries production in 1998 to the present level of 42% of total fisheries production in 2011. It is soon predicted to become a bigger contributor to global fisheries production than capture fisheries.

Though India is ranked second behind China in world Aquaculture production (2010), its contribution to world production is only 4.64 million tons accounting for 7.75% of world production as against 36.73 million tons amounting to 61.38% contribution by China. The gap between the two top ranked countries is uncomfortably wide.

While India depends largely on land based Aquaculture systems i.e., traditional earthen ponds adjoining to freshwater and brackish water sources for culture of Freshwater Carps, Catfish, Scampi as well as Shrimp, China use upto seven biocategoriesof Aquaculture systems

such as indoor Raceways, Earthen ponds, Open seas, Bays, Rivers, Reservoirs and Lakes and farm over 75 species for Aquaculture. Technology development in introduction of new species and new biocategories for diversification of aquaculture is slow and of recent origin. Only 15% of the available land resources and almost none of the water resources such as reservoirs, lakes, bays and seas are utilized for aquaculture in India. Thus the major reasons for the gap are "Unutilization and Underutilization" of available resources.

Each of us –the research institutions, academe and the industry,have our roles cut out to bridge this gap. Opportunities require to be created through the expansion of the Seafood industry that would not only ensure sustained aquaculture production, but also contribute in employment generation and alleviation of socio-economic conditions of communities involved in the sector.

The theme chosen by the organizers of this National Seminar, "Emerging Species, technologies and innovations in Aquaculture" assumes great significance in the present Indian context. "Innovation" involves three basic steps.Firstly, the development of infrastructure for the establishment of new approached and technologies in Aquaculture, secondly, the development and standardization of new aquaculture technologies as well as technologies that assist in sustaining available technologies in the country and thirdly the dissemination of these technologies to the Industry for adoption at all levels.

Several years of Aquaculture research in India could not substantially contribute to commercial aquaculture diversification. Besides, lack of holistic research efforts also resulted in piece-meal research efforts, leading to several gaps in technology. It has just been farming a few species of Fresh water fish, Shrimp and Scampi over the last three decades with neither any major technology innovations nor organized attempts towards genetic improvement of species.

The Marine Products Export Development Authority therefore stepped forward to take up technology development for export oriented species, through Rajiv Gandhi Centre for Aquaculture (RGCA), to augment raw material supply. The technology development programmes of RGCA are focused on lending sustainability to Aquaculture production in the country through a three pronged strategy.

The first strategy is the **Diversification of Aquaculture** by developing technologies for seed production and farming of new species like Mud Crab, Groupers, Seabass and Cobia. All these species are endemic to the country, highly suitable for aquaculture and being farmed successfully in several countries across the world. Technological breakthroughs have been made at all the above ventures of RGCA. Technologies have been developed for year round production of Asian Seabass Seed and seed is being supplied continuously from the hatchery facility of the project, technology for farming the species in cages in Aquaculture ponds, open ponds and cages in open water bodies has been demonstrated. It is estimated that over a million Seabass seed is stocked annually in the country for farming. Technology for mass production of Tiger Grouper fingerlings has been developed and technology for farming of hatchery produced Tiger Groupers in open sea cages has been demonstrated by RGCA at Andamans. India is one of the select countries in the world that has established a full-fledged Mud Crab hatchery. Record survival rates as high as 18.1% has been achieved in Crab instar production at the RGCA hatchery as against the world average of 3.5%, giving scope for speedy commercialization of Crab hatchery technology. Similarly, RGCA has also developed technologies for year round production of Cobia seed and successfully demonstrated farming of Cobia in sea cages. Cobia seeds are being supplied from the facility to research institutions and farmers both in India as well as abroad to countries such as Iran and Philippines.

The second strategy is the **introduction of New Species for Aquaculture** in the country such as Tilapia and the Pacific White Shrimp *L.*

vannamei that have met with resounding success across the world. When Govt. of India decided to permit introduction of the pacific white shrimp SPF (Specific Pathogen Free) broodstock in a regulated manner, MPEDA, as part of its relentless efforts to sustain the Indian shrimp industry, came forward to create and operate Aquatic Quarantine Facility for *L. vannamei* through RGCA. This facility, which is at par with international standards, facilitates quarantine of imported Specific Pathogen Free *L. vannamei* broodstock, under the Animal Quarantine & Certification Services, Dept. of Animal Husbandry Dairying & Fisheries, MOA, Govt. of India and functions as the single point of entry for the *L. vannamei* broodstock. Since inception of this facility 1,20,793 L.*vannamei* broodstockwere quarantined and released to approved hatcheries across the country.

The introduction and farming of *L. vannamei* in India through this approved quarantine premises had benefitted in augmenting the marine shrimp production through aquaculture of the county from a level of about 88,800 MT valued atRs. 1915 Crores in the year 2008-09 to about 145600 MT valuedRs. 3585 Crores in 2010-11 and further to about 224500 MT valued at Rs. 6600 Crore in 2011-12. Since its full fledged introduction, the aquaculture production of *L. vannamei* rose exponentially from a level of about 1730 MT in 2009-10 to about 80,717 MT in 2011-12 recording an annual growth rate of about 583%, thereby increasing its share in the total cultured shrimp production from a mere 1.6 % to about 35.9 % within a span of two years. Shrimp being an export-oriented commodity, it would be interesting to analyze the impact of this growth on exports. The total shrimp export which was about 1,30,000 MT worth about Rs. 3900 Crore prior to introduction of vannamei rose to about 1,89,246 MT worth Rs. 8,167 Crore in the year 2011-12. The annual growth rate achieved over the last three year period was about 20% in terms of quantity and about 40% in terms of value. The export of aquacultured shrimp during the same period showed growth rates of 34 % and 47 % in terms of quantity and value. The provisional estimates of cultured shrimp production during the current year show that the total shrimp production which includes L. vannamei also are set to cross new heights.

Considering the stakeholders demand for expanding the vannamei industry in our country and also to augment the country's export revenue, the AQF recently launched its additional wing (Phase-II) in early January'13, to quarantine more vannamei brooders keeping the sustainability of the industry in prime focus. This new facility with two receiving areas and three quarantine cubicles has already started functioning since January 2013. The tentative number of brooders that can be quarantined from this phase is estimated to be 35,650. The third and the final phase of the facility is also underway which will have 13 quarantine cubicles, boosting the total quarantine capacity of the facility to 20 cubicles which can quarantine approximately 2.37 lakhs brooders/annum. This would facilitate a 5 fold increase in shrimp aquaculture production and subsequent revenue earnings to the country in addition to the auxiliary benefits such as employment opportunities in farming sectors, seafood processing and feed manufacturing units.

The third strategy and by far the most important one for sustaining Aquaculture production is through the implementation of **Domestication and Selective breeding programmes**. It is a well established fact that the domestication programmes taken up on the three species; the Atlantic Salmon, the Nile Tilapia and the Pacific White Shrimp *L. vannamei* form the backbone of aquaculture production in the world today. Such programmes not only assist in production of disease free/resistant stocks but also assist in developing lines that grow faster, to larger sizes andwith better FCR.It is unfortunate that not a single domestication programme was initiated in the country in Aquaculture till RGCA established the Domestication of Black Tiger Shrimp project at Andamans. RGCA has achieved the development of 6th Generation SPF Tiger

Shrimp stocks during the pilot scale operations. Infrastructure developments for the main project are nearing completion and with the establishment of a Broodstock Multiplication Centre on the mainland, RGCA would be able to supply SPF Tiger shrimp stocks to the Industry.

RGCA has since also established a project of the Giant Fresh water Prawn (Scampi) in Krishna District AP where technological breakthroughs have been achieved in the development of superior strains of Scampi that perform best in Indian conditions have through a large scale, field level diallel crossing experiment. A selective breeding programme has been initiated at the project with these strains. This project has also standardized technology for "all-male" Scampi seed production through the development of "Neofemales" - females produced through sex reversal of male scampi by microsurgical interventions in male post-larvae. The Neofemales yield all male seed upon breeding. These technological innovations have been achieved by no others in the country and will be made available to the Scampi farming industry within a very short time.

Further, as a long term measure to sustain the vannamei farming, RGCA has also established a Broodstock Multiplication Centre for *L. vannamei* at the TASPARC facility of MPEDA at Visakhapatnam. This is being undertaken by RGCA in technical collaboration with the pioneers in *L. vannamei* selective breeding, M/s. Oceanic Institute, Hawaii. RGCA received the first batch of PL germplasm from Hawaii during September 2012. These stocks are being grown to broodstock for supply to the *L. vannamei* hatcheries across the country from April 2013 onwards.

This facility has a capacity for production and supply of 45,000 SPF L. vannameibroodstock per annum and the Broodstock will be custom made for best performance in India. This facility will provide High Quality SPF L. vannameiBroodstock at reasonable rates to hatcheries in the country. RGCA will soon also establish a Nucleus Breeding Centre for *L. vannamei* in the country to make it self sufficient in L. vannamei SPF broodstock.

RGCA has also established a fully pedigreed Selective Breeding Programme of GIFT strain Tilapia in India in collaboration with the WorldFish Centre Malaysia at Manikonda in Andhra Pradesh. Tilapia is one among the most farmed and most consumed fish around the world and requires to be promoted for farming in the country. 60 families of GIFT stocks were imported last year, grown to broodstock and selectively bred for the successful production of 60 families of the first Generation of GIFT stocks in India. Subsequently breeding of the First Gen GIFT stocks in India are now being bred for the production of second generation GIFT stocks in India. The project presently is geared up to supply all male Tilapia fry of both GIFT strain as well as GMT (Genetically Male Tilapia) from M/s. FishGen UK to farmers across the country and to supply germplasm for the establishment of satellite breeding centres across the country. This project would go a long way in supporting the Tilapia farming industry that is on the verge of a major take-off in the country.

For all the above, RGCA has established modern, state-of-the-art infrastructure facilities that include RAS or Recirculation Aquaculture Systems for enhancing production capacities &addressing bio security concerns and traceability issues. In support of the above systems, RGCA has also invested on development of production technologies for Artemia, Rotifer and Copepods for support of and enhancing bio security in Aquaculture systems.

The Artemia Project of RGCA established in Tuticorin, has successfully developed the technology for mass production of Artemia cysts &Artemia Biomass through Aquaculture in saline Salt pan areas. A record production of 231.5 Kg Artemia wet Cyst/Ha/Crop of 60 days has been achieved at the project. This technology is most suitable for adoption by SHG's in saline wastelands and by salt producers to augment their unit area income. RGCA has commenced thesupply of Artemia cyst in limited quantities

and WSSV screened frozen Artemia biomass to ornamental fish breeders, finfish and Shrimp hatcheries

All the technologies developed at various projects of RGCA are disseminated to the industry at the Technology Transfer Training and Administrative Complex of RGCA, established at Sirkali, Nagapattinam Dt., Tamil Nadu. These sustainable technologies developed by RGCA are now being made available in a phased manner to the average Indian farmer who will now have multiple options for choice of the species he wants to farm based on the available infrastructure facilities that he has and based on the marketability and profitability that farming any species offers. This wing of RGCA organizes training & awareness programmes in aquaculture of various species from time to time. The Technology Transfer & training division also conducts international Seminars and training programmes that are highly relevant to the needs of the industry.

The Technology Transfer Training and Administrative Complex of RGCA has also setup a state-of-the-art Aquaculture Library – an exclusive library totally focused on all the aquaculture related areas. Besides, a excellent central Central Genetics Lab for aquaculture and a Central Aquaculture Pathology Lab also functions at this facility. The Pathology Lab is capable of screening all the known pathogens of shrimps and cultivable fishes.

Kerala with its highly productive natural resources has great potential for establishment of several innovative aquaculture culture practices. It is requested that the state again take the lead just as it had done while establishing the Department and initiate pioneering aquaculture projects that would serve as an eye opener for the rest of the country. Several opportunities lie ahead for the upcoming professionals in the Aquaculture sector that is poised for a giant leap. The industry beacons the best brains of the industryto contribute to its development at the field level. I hope that the contributions made by several scientists, research scholars and professionals in this Seminar would go a long way in taking the Aquaculture Industry in the country to new heights.