

TOWARDS SUSTAINABLE AQUACULTURE

By E.G. Silas

(Keynote address: at the Inaugural function of "INDAQUA 93" at Madras on 19-3-93).

I feel greatly honoured that Dr. Sakthivel, Chairman MPEDA should invite me to give a Keynote address, which I have titled "Towards Sustainable Aquaculture".

The inauguration of the five-day "INDAQUA 93" marks a milestone in the development of aquaculture in India - a prime investment area. We badly need such a demonstration of technology and interaction by producers and users, and we salute the Marine Products Export Development Authority for this initiative.

Development also demands perspective planning and in fisheries, the global scenario is that by 2000 A D the demand of fresh fish and shellfish is expected to increase to 130 million tonnes, while the present production hovers around 100 million tonnes. A bulk of the projected demand has to come from aquaculture, which now accounts for more than 18 million tonnes, a quantum jump from 1973 when it was hardly 5 million tonnes. The accelerated growth in this sector is expected to double production within the next decade. Inland and coastal aquaculture production in India exceeds one million tonnes, of which, farmed shrimp constitutes about 4 per cent. **Refinements in induced breeding techniques, and hatchery production of seed, composite fish culture and polyculture have considerably aided the rapid growth in inland carp aquaculture.** Recent developments, to infuse confidence for investment in aquaculture are:

1. The spectacular success of the Andhra fish farmer in the Kolliru Wetlands in increasing fish production from a subsistence level to over 80000t to a semi-intensive level with supporting infrastructure for production of carp seed, feed and marketing-- all within a short span of 7 to 8 years.
2. The production of more than 6 tonnes/ha per annum in shrimp farming operations achieved in the Corporate and Private Sectors in Tamil Nadu and West Bengal, with AP leading the way in semi-intensive culture. Infact Nellore and Tuticorin have become two major focal points for shrimp farming in the country.
3. The intensive culture of hybrid Tilapia using distillary waste through culture of protein rich Spirulina, successfully being carried out in Tamil Nadu.
4. Success in the breeding and culture of many marine cultivable organisms such as Crustaceans (Shrimp, Lobster, Crab) Molluscs (Clams, Cockles, Mussels, edible oyster, pearl oyster), Echinoderms (Sea cucumbers), and Sea Weeds and technologies developed by research institutes.
5. The excellent success of breeding and propa ation of Macrobrachium rosenbergi, the fresh water prawn at the College of Fisheries of the Agri.Univ. Cochin.
6. The attempts at indigenious production of feeds for diversified end uses and the equipments coming into the market for maintaining water quality in hatchery and grow out systems, and processing for value added products.
7. The "Wonder Product" namely **Chitosan** developed as a high grade product for multifarious uses by the fishery technology institute, Cochin a biological product which is also a growth promoter.

8. That organizations, such as, MPEDA now aid with advisory services in farming, harvesting, packaging and marketing.
9. The whole new generation of entrepreneurial skills with management expertise which has come into the aquaculture sector along with institutional financing, with the result that the fish and shrimp farmer today is more aware of problems, needs and requirements - the right step in shifting from empirical to scientific farming. The need of the hour is blending this managerial acumen with technical skills.
10. Most important, the national awareness of the importance of aquaculture both for augmenting food production as well as earning foreign exchange.

While these may be positive signals, we are beset with many problems, some of which may retard or impair existing developments and may have impact on future planned projections. To mention a few:

1. We have not given any serious planning to upgrade the existing 35000 ha of brackishwater culture systems under traditional shrimp and fish farming, about 5000 ha in Kerala (the Pokkali fields) and about 30000 ha in West Bengal (the Bheries and Nonabheries). There is no visible improvement in the production of finfish and shrimp from these systems which account per ha per annum to hardly 500 kg of shrimp. If a master plan for these tidal fed systems could be developed, for manageable pond size, better water management, selective stocking and harvesting, it should be feasible to obtain a six to ten-fold increase in the production of finfish and shrimp. Public policy on this is essential, and MPEDA should trigger action.

2. Chilka has been in the news and one of the major issues centres on aquaculture development. While this is under consideration, I would suggest that we take a look at the shrimp farming programme under the Economic rehabilitation of Rural Poor (ERRP) and those financed by the Area Development Approach Programme (ADAP) covering over 500 ha of rainfed ponds, each of an area of about 0.2 ha or so - Whether the system could be upgraded with more efficient water management or left to go follow. Also the impact of expansion of subsistence activities in the Lake, involving an unregulated explosive increase in traps and other fishing gear without concern for the carrying capacity of the lake. A similar situation prevails in other brackishwater, backwater and estuarine areas in the country.
3. What is the reason for the tardy progress in the development of aquaculture along the West Coast? What is happening to the coastal land use policy and the guidelines developed for representational allocations for shrimp farming.
4. Our carp culture stocks are said to be seriously inbred.
Reduction in growth and reproductive performance, increased incidence of diseases, and morphological deformities are said to have been brought about by the genetic deterioration of the farm stocks. It is said that the broodstock selection process are counter productive in our carp polyculture systems resulting in a tendency to breed inadvertently slower growing, and later maturing fish. In short, each carp hatchery is said to function as an "isolated self supporting genetically closed unit", leading to inbreeding and genetic

drift. We need well laid breeding plans and programmes in biotechnology that could be taken up to develop and demonstrate proper systems of broodstock management for finfish and shrimp.

5. The efficacy of state run hatcheries, and fish farms, for finfish and shrimp needs critical evaluation, as to their functional efficiency and performance as change agents in fostering and propagating aquaculture in rural areas. Fisheries/Aquaculture extension is perhaps one of the weakest link which need strengthening.
6. One comment I hear from our shrimp farmers, is that, some of the feed that is produced and marketed in the country are not giving the desired or expected results in biomass increase, while success has been achieved with imported feeds. This is a matter of grave concern and also partly reflects our inadequacy of knowledge about the nutritional requirements of the species cultured, at various growth phases. The magnitude of the problem will be realised if we consider the number of candidate species being cultured, the projected area for fish and shrimp farm development and the diversified types of feed required for the hatchery, nursery and growout systems, and in special cases even for different sexes, and for the broodstock. To cite one example, MPEDA has projected 100,000 ha of brackishwater area under shrimp farming by 2000 AD, about 55000 ha increment over the present area, for which the feed requirement is expected to be around 150 000 tonnes for one crop. It may be possible to harvest even two crops from a greater part of the area - and this is only at an extensive level of production of less than 2 t/ha Technology wise- we are moving on to a phase of feed extruder Technology for fish and shrimp feeds with attractants, flavour, non-steroid growth promoters such

as single cell protein (Spirulina), yeast, alfa alfa and so on with good water stability and high digestability. There is need for developing feeding strategy for species and the fish and shrimp farmer made aware of this. Thus, as for fish and shrimp nutrition and feeds a whole array of challenging problems confront us.

7. The disease of wild fish stocks is least understood. This is very evident from the calamitous wide spread occurrence of the Epizootic Ulcerative Syndrome (EUS) which has, and is playing havoc in South East Asian countries, including India. The socio-economic problems arising out of this affliction, affecting inland fish farmers, fishermen, and consumers has been well highlighted by the media and at various public forums. The suggested remedial measures have great limitations for wide-spread application in large water-bodies. Shrimp are also on the picture as Cotton shrimp and white chalk (Chunnambu) shrimp can be devastating. These problems are bound to come up with faulty feeding and poor water management.

A serious constraint in the sustainable production of carps from the Kolliru wetlands is again water quality and fish diseases. The situation will get more aggravated with increased pollution from excessive feeds, accumulation of metabolites, poor water management and eutropication.

Whether it be, carp or shrimp culture covering large areas, there is need for disease diagnostic laboratories with mobile facility to be setup at selected centres, as service and advisory

centres for the fish and shrimp farmers. Concurrently it is also necessary for research to go into breeding of fish for disease resistance which has met with some success in other countries.

A WORD OF CAUTION - It is imperative to prevent pathogens acquiring resistance to drugs, and as such, stringent regulations in the use of antibiotics in fisheries will be necessary - be it shrimp, carp or ornamental fish. Though vaccines at great expense can also be developed, the ultimate solution would be production of genetically improved fish strains resistant to diseases.

It does not stop there - the stress today is also on human health hazards, posed by presence of residues of antibiotics, and anabolic steroids in farmed shrimp used in feeds, the former to prevent infection and mortality, and the latter to promote fast growth (The Johnson Syndrome). Absence of drug residues is a must and rigorous testing and vigil on prawns imported into Japan exists, and western markets in Europe and U.S.A., may implement such restrictions. Our fish and shrimp farmers and feed manufacturers should take note of this.

3. Though we speak of gainful employment in aquaculture for rural communities, this has yet to materialise. There has not been much impact in this area. Dr. M.S. Swaminathan used the term "SYMPHONIC AGRICULTURE" to denote the evolutionary state in the development of sustainable agricultural production systems, in which all the components of an agricultural action plan, becomes mutually reinforcing; when synergistic packages of technology, services and public policies are developed and introduced in a mutually supportive manner. In aquaculture this is a mere concept, and we have yet a long way to go to put this into practice.

Besides these, there are several other issues which may come up for discussion in the ensuing Business and Technical Sessions. However, I would like to mention that our efforts at aquaculture development, should also be tempered, with our effort to conserve our animal and plant genetic diversity, be it aquatic or terrestrial. The aquatic habitats are highly vulnerable and many areas are already stressed, due to pollution and other human activities. Indiscriminate introduction of exotic species without proper screening must stop.

The eighties had witnessed appreciable progress in the application of gene manipulation techniques in aquaculture involving gynogenesis, androgenesis, triploids, monosex culture and sex reversal. Transgenic fish have been produced successfully in Tilapia, carps, loaches, goldfish, larvicidal fish Oryzias laticeps, rainbow trout, Atlantic salmon and the channel catfish to mention a few. The fact that eggs of finfishes, crustaceans molluscs could be obtained in large numbers and can be fertilized under controlled conditions, throws up wide vistas in genetic engineering. As in plant based and animal based agriculture, introduction of novel genes into aquatic organisms will make a major contribution to the development of aquaculture.

Cryopreservation of milt, of fish, and shellfish, is a promising emerging area where a great deal of work is necessary to make it an important technology in aquaculture - as in dairy animal reproduction.

Just as the use of farm animals as a source of valuable pharmaceutical products, the use of fish as producer systems need to be investigated. As in Agriculture, in the Context of Dunkel Draft Policy, which is under consideration of the Government, the whole issue of Intellectual Property Rights (IPR) whether Trade Related or not, Fish Variety Protection (FVP), Fish Breeding Rights,(FBR) are matters for concern.

For attaining sustainable production, the production process in aquaculture should be linked with manageable inputs. In India today, for a sustainable production, a semi-intensive level of aquaculture is what is most relevant, a production of 5 to 6 tonnes per ha which by itself is a giant leap from what prevails. In order to support, and sustain such a strategy, I strongly recommend the need for developing a Mission oriented NATIONAL AQUACULTURE PLAN.

A National Aquaculture Plan - A Necessity

Aquaculture entails involvement of the Central Government, the State Governments, the Central Institutes, the Agricultural Universities, Financial institutions, the industry, the rural fish farmer and other sectors which give it a national perspective. This calls for a national aquaculture plan to be evolved. The Plan should enable aquaculture to be developed as an industry for attaining the goals of providing food, employment, income generation and other values for the public. The plan should aim to provide adequate supply of aquatic food for internal consumption and exports and to develop new industries by the judicious conservation, development and utilisation of land and water through aquaculture. It should help to improve and promote the economic, financial, scientific and institutional base needed for the balanced development of aquaculture per se, and an integrated system for the production of low cost protein, as well as high value species. It should help to augment and supplement stocks of fish and shell fish for commercial and artisanal exploitation, where natural populations are depleted by indiscriminate exploitation and poor management; by pollution and destruction to natural habitats. Conservation and utilisation of our inland and coastal wet lands and already degraded mangrove areas without impairing the ecosystem, thus gains importance.

Individual species plans will have to be developed and should consider constraints to development and research needs of important species or combination of species. The species plans will naturally involve or take into account (1) research needs, (2) proven technologies and demonstration facilities, (3) economic data, (4) market outlets, (5) sources of financial assistance and levels of funding, (6) legal and regulatory measures for land and water use, (7) multiple use conflicts, (8) technical assistance at various levels, (9) transfer of technologies and food back, (10) processing, product development and product quality control.

I am positive that a constructive national aquaculture plan would start yielding results immediately as the States could also develop their own specific programmes to meet the State and national demands. In fact, in India, aquaculture could overtake capture fisheries within the next decade, without causing imbalances in other fisheries sectors. Such a development is only logical, and will be in the country's interest. I am glad that the Ministry of Commerce, Government of India, has brought shrimp farming under **"Extreme focus"**. The scope of this **"Extreme focus"** should be enhanced to embrace aquaculture per - se and the Ministry should effectively coordinate, all research and development activities in aquaculture, presently dispersed through a number of Central Ministries.

May "INDAQUA 93" serve as a Catalyst, to synthesize an action plan, for the accelerated development of inland and coastal aquaculture in India.

Thank you,

(E.G.SILAS)