

Livelihood and Empowerment of Coastal Communities through Molluscan Culture

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Global aquaculture production is estimated as 82.1 million tonnes (FAO, 2018). Molluscs mainly bivalves account for more than 20% (17.7 million tonnes). The rate of increase in production is positive and growing.

Bivalve farming

Bivalves, especially mussels and oysters, are considered nutritionally rich health food and form an important candidate species for sustainable aquaculture globally. Mariculture of bivalves have greater importance in meeting the increasing protein demands of the human population.

Edible Oyster farming in India

Edible oysters are a great delicacy and in India there is growing demand or oyster meat in some parts of the country particularly Kerala, Karnataka, Goa and Maharashtra.

Central Marine Fisheries Research Institute undertook scientific investigations at Tuticorin from early 70's and as a result, complete package of the technology is now available in the country. Vast stretches of backwaters, estuaries and bays spread over several lakh ha. Are present along Indian coast harbouring natural population of the oyster suggesting suitability of the habitat for oyster culture. Being filter feeders, the oyster converts primary production in the water into nutritious sea food.

Oyster farming technology developed by Central Marine Fisheries Research Institute is a simple and easily adaptable technique. Since 1993 concerted effort has been put in by CMFRI to popularize this technology. Kerala is the first state to commercialize this technology and many coastal villagers have benefited from this. These farming activities have increased national production of farmed oyster from nil to 140 tonnes in 2000. One of the significant factors is that more than 80% of the oyster farmers in Kerala are women and they have emerged as productive, self reliant participants for improving the families' nutritional and living standards.

Mussel farming

Mussels are bivalve molluscs typically found inhabiting the littoral to shallow sub-littoral zones of the coastal areas attached to hard substrates such as rocks, laterite stones, concrete pillars etc. through long threads called byssus threads. Approximately 17 species of edible mussels are cultured and harvested worldwide. China ranks first in mussel production.

Role of CMFRI

CMFRI has developed eco-friendly techniques for mussel culture. Mussel farming is a relatively less intensive form of aquaculture that depends upon natural stocks for seeding. The two species of mussels with good potential for culture in India are the green mussel, *Perna viridis* and brown mussel *P. indica*. Open sea culture of mussels was initiated by the CMFRI off Vizhinjam and off Calicut during the 1970's and since then it have been upgraded and refined for commercial production. The Calicut Research Centre of CMFRI successfully demonstrated mussel culture in the Dharmadam estuary during 1995-96. First successful long line mussel farming was demonstrated at Andhakaranazhi off Kochi in 1994-95. Commercial farming gained rapid strides since 1996 in India.

Success stories through community engagement

Mussel and oyster farming is simple, sustainable and an easy to adopt aquaculture practice by coastal communities without a high investment in feed. However, the initial transfer of technology programmes did not succeed. This situation prompted CMFRI to establish an interdisciplinary approach to disseminate the developed technologies. A critical examination of the technologies revealed that there are four disciplines that control the success of the technologies:

- Environmental science for identifying unpolluted, biologically suitable farming sites;
- Bivalve biology for determining seed collection and harvest timings;
- upgraded mariculture technologies for improving profit margins and for ease of operations and;
- Transfer of technology involving demonstrations with farmers.

A success story of developing an aquaculture practice, bivalve farming, implemented in the Southwestern States of Kerala and Karnataka is presented here that was able to:

- increase the aquaculture/seafood production on a sustainable basis;
- provide employment opportunities to coastal women, youth and the elderly;
- utilize the underutilized coastal backwaters for aquaculture effectively;
- promote entrepreneurship among women as aquaculture managers; and
- Develop a series of ancillary industries in the coastal villages of Kerala to support aquaculture.

The existing technologies of mussel and oyster farming were converted into an income-generating activity for coastal fishers, particularly for women's self-help groups. As a result of a concerted approach, coupled with novel extension techniques, commercial mussel and oyster farming became established in the States of India, Kerala and subsequently in Karnataka. Production in 2009 was over 20000 tonnes making India one of the top ten bivalve farming countries in Asia.

A Value Chain on High Value Shellfishes from Mariculture Systems was implemented to develop a sustainable high value shell fish value chain which resulted in

- commercialization of farming techniques
- production of value-added products like ready –to –serve/cook products
- popularization and promotion of farmed products
- production of oyster flavour extract
- commercialization of farmed value-added products

Efforts were focused to make this value chain economically viable and sustainable

Moothakunnam village cluster in Ernakulum district was identified for implementation of project activities. Women Self Help Groups interested in oyster high-value shellfish were identified and trained in oyster farming techniques for achieving higher yield. Technical guidance all along the crop growth and harvested period was given by CMFRI.

Depuration protocols for mussels and oysters for ensuring quality

Bivalves are filter feeders. During this process they accumulate all suspended biological materials including harmful micro-organisms. Before the product reaches the market, these materials have to be removed from their gut. Simple depuration can be achieved by starving the bivalves in clean and filtered seawater/brackish water for a certain period of time. More effective depuration can be achieved by using disinfected (chlorinated or ozonized) water in the depuration process.

Development of a common depuration unit in the village

A common depuration facility was set up in Sathar Island which aims to supply quality oysters to the public and to establish an ancillary business of purifying oysters. Such oysters now command a premium price in the market thereby increasing the profit margin for the farmers. The unit has specially designed tanks with slope, inlets and outlets. The water is treated by passing it through cartridge filters and UV filters.

Design and development of an oyster steamer for hygienic processing

An oyster steamer together with a steam generator was designed and fabricated. This ensured that weight loss because of heat was reduced to 35 percent. This also ensured quality product for further value added processing.

Significant interventions

Two new value chains have been developed

- Fresh depurated oysters for live consumption in high-end restaurants
- Production and marketing of value-added products of farmed oysters from VAP unit under the brand name ‘MUZURIS’

With the organization of special training programmes for chefs, several high-end hotels such as Casino Group of Hotels (CGH Earth), Taj Malabar, Gateway Residency (Kochi) and Taj Mumbai have started procuring and serving live oysters to their guests. As a result of this,

a substantial increase in incomes of farmers became evident as the unit price of live oysters increased fifteen fold, from Rs.1 to Rs.15/oyster.

The Impact

Technology adoption and increased seafood production

As a direct effect of the TOT efforts by the CMFRI team, the farmed production of bivalves has increased from 2 tonnes in 1997 to 19 882 tonnes in 2009 making the nation one of the top ten Asian countries in farmed bivalve production.

Impact on rural employment: self-employment and creation of employment

Opportunities

Widespread awareness of the technology prompted many villagers to adopt the technology.

Women's empowerment through bivalve farming

The biggest outcome of the growth of bivalve farming in Kerala was the empowerment of women with 87 percent of the SHG farms owned by women. It is well known that women represent about 70 percent of the poor and there are gender inequalities. Farming of marine mussels has been found to be a women-friendly technology in Kerala. The technology was chosen by the women self-help groups (SHGs) in Kasaragod, a coastal district in north Kerala. These groups were designed as a strategy for poverty alleviation, and also to increase women's access to resources and power in household decision-making.

Leadership development in women

The fact that women increased the farm area and intensity of farming shows that they became efficient aqua-planners and aqua-managers and it also proved that women are better carriers of development.

Development of new markets and value chains

Commercialization of bivalve farming has led to the development of several new value chains in the Kerala State. Initially the markets were within 5 km radius of the farm site in the village. Now the farm produce is sold as live oysters/mussels and also as value added products. The latter has led to the expansion of markets to areas several hundreds of kilometres away from the farm site. Live oysters have been taken even to the Hotel Taj, Mumbai from farmers near Kochi.

Way forward

It is quite clear from the fast pace of its development in the state of Kerala that bivalve farming can develop as a new sunrise mariculture industry in India. Unlike other aquaculture industries, it is not capital intensive and offers great scope for improving the incomes of the rural fishers as an alternative livelihood. But primarily, what has spurred its growth in Kerala is the considerable demand for the produce among the populace.

To ensure the sustained development of this new industry policy-makers and planners need to:

- Promote bivalve farming in all maritime states of India using Kerala as a model of development
- Develop methods to collect seeds from the wild since farming depends on seed availability from natural sources or, alternatively, develop mussel hatcheries for meeting the increasing demand for seed
- Conduct awareness campaigns for improving bivalve consumption in India;
- Encourage value added products (VAP) for bivalves to increase marketing possibilities (especially live oysters) and to make the farming practice more remunerative.
