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Digital Object Identifier: <http://dx.doi.org/10.4172/scientificreports.822>

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# The Paradigm of Mainstreaming Gender Perspective in Marine Fisheries Sector of India

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## Introduction

Gender mainstreaming is a strategy articulated with gender and development goals and a commitment to gender equality in all aspects of policy and program design and implementation which aims to transform the mainstream at all levels to end gender discrimination. The paradigm of mainstreaming gender perspective possesses certain prerequisites such as sound political will, specific gender equality policy, statistics (gender disaggregated data) comprehensive knowledge of gender relations, knowledge of administration, necessary funds and human resources, female participation in political and public life and in decision making process. Sex is the biological difference between women and men, whereas gender is the socially constructed differences between women and men. Speaking gender equity and equality, equity is the means and equality is the result. Equality is rights based in such a way that women and men have equal rights, enshrined in international standards and treaties and should have same entitlements and opportunities. Equity means justice so that resources are fairly distributed, taking into account the different needs of women and men. As a part of the assignment to prepare a country paper of Indian perspective on gender mainstreaming in marine fisheries by the UPM (University Putra Malaysia) in the ASEM Aquaculture Platform WP7, workshop on 'Empowering Vulnerable Stakeholder Groups' organised in Kuala Terengganu of Malaysia during the period from 6<sup>th</sup> to 10<sup>th</sup> February, 2012 which focussed on gender and aquaculture, the policy makers and extension scientists who represented India in the workshop were entrusted as authors of the present paper. The article highlights the glimpses on gender mainstreaming and explores the selected practical case studies pertaining to Indian marine fisheries sector focusing attention on the gender equity and equality emphasized in the Indian context. The mariculture potential of India is vast as there is great scope for developing farming of shrimps, pearl oysters, mussels, crabs, lobsters, sea bass, groupers, mullets, milkfish, rabbit fish, sea cucumber, ornamental fishes, seaweeds etc. The mariculture technologies conspicuously being disseminated by Central Marine Fisheries Research Institute (CMFRI) with involvement of women and those possessing potential for women's participation include mussel farming, edible oyster farming, pearl oyster farming and pearl production, clam culture, lobster farming and fattening, crab farming/fattening, sea cucumber culture, marine finfish culture, ornamental fish culture, seaweed culture, open sea cage farming etc.

The Central Marine Fisheries Research Institute (CMFRI) established in 1947, in India has been carrying out pioneering research and development work in the arena of marine fisheries with the objectives of ensuring fisheries resource, ecosystem and livelihood sustainability in the country. Since 1971, the headquarters of the Institute is in Kochi, Kerala State. Presently the Institute has three regional Centers at Mandapam Camp of Tamil Nadu, Visakhapatnam of Andhra Pradesh and Veraval of Gujarat. Research Centers are located at Mumbai, Karwar, Mangalore, Calicut, Vizhinjam, Tuticorin and Chennai. In

addition to these there are fifteen field centers throughout the coastal belts of the country. The infrastructure and research facilities at the headquarters and research centers include three sea-going vessels, five research hatcheries, four marine aquaria, three biodiversity museums, state of art research laboratories including an electron microscope, an Agricultural Technology Information Centre (ATIC), Agricultural Research Information Service Cell (ARIS), a well equipped library with server, a Krishi Vigyan Kendra (KVK), farmers' rest rooms, students' hostels, marine farm. etc. The vision of CMFRI is focuses on sustainable marine fisheries through management intervention and enhanced coastal fish production through mariculture for improved coastal livelihoods with the major mission to develop information based management system for changing over from open access to regulated regime in marine fisheries, augment costal fish production through mariculture and sea ranching and restore critical marine habitats. The mandate focuses on sustainable marine fisheries through management intervention and enhanced coastal fish production through mariculture for improved coastal livelihoods with the major mission to develop information based management system for changing over from open access to regulated regime in marine fisheries, augment costal fish production through mariculture and sea ranching and restore critical marine habitats. The mandate focuses on monitoring the exploited and assess the under-exploited of the marine fisheries resources of the Exclusive Economic Zone (EEZ), understanding the fluctuations in abundance of marine fisheries resources in relation to change in the environment, developing suitable mariculture technologies for finfish, shellfish and other culturable organisms in open seas to supplement capture fishery production, acting as a repository of information on marine fishery resources with a systematic database, conducting transfer of technology, post graduate and specialized training, education and extension education programmes and providing consultancy services.

The Marine Fisheries Census in 2010 accomplished by CMFRI specifies that, there are 3,288 marine fishing villages distributed among the nine maritime states and the union territories of Pondicherry, Dan and Diu. Marine fishermen households were 8,64,550, of which 1,92,697 are in Tamil Nadu, 1,63,427 were in Andhra Pradesh and 1,18,937 were in Kerala. Among the marine fishermen households 7,89,679 (91.3%) were traditional fishermen families. Nearly 61% of

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**Received** August 26, 2013; **Published** November 27, 2013

**Citation:** Vipinkumar VP, Meenakumari B, Jayasankar P, Shanthi B (2013) The Paradigm of Mainstreaming Gender Perspective in Marine Fisheries Sector of India. 2: 822. doi: [10.4172/scientificreports.822](http://dx.doi.org/10.4172/scientificreports.822)

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the marine fishermen families in the country (5,23,691) were below the poverty line. Total marine fisher folk population was 3,999,214. Overall sex ratio was 928 females per 1000 males and was below 1000 in all maritime states. Sex ratio was maximum in Pondicherry (982) and the minimum in West Bengal (865). Regarding education, 57.8% of fisher folk were educated with different levels of education and with regard to occupation, 37.8% were engaged in active fishing with 83.4% having full time engagement. About 2.4% were engaged in fish seed collection of which 54.4% were full time. Nearly 81.8% of fisher folk in marketing, 88.1% in curing and processing and 89.6% in peeling were women. Looking into the religions demarcation, 75.47% were Hindus, 15.21% Christians and 9.28% were Muslims. Hindus were the dominant religion among marine fishermen households in all the maritime states and union territories except Kerala. Overall% of SC/ST among the marine fishermen households was 16.6% and 32% of adult fisher folk had membership in co-operatives. As much as 131,012 families were having lifesaving equipment's. There were 1,94,490 crafts in the fishery out of which 72,559 (37.3%) were mechanized, 71,313 (36.7%) motorized and 50,618 (26.3%) non-motorized. Out of the total mechanized crafts owned by the fisher folk 28.9% were trawlers, 42.8% gillnetters and 19.1% were dolnetters. Marine fish landing centers were 1,511. Among the motorized crafts, 60.3% were fiber glass boats, 12.5% plywood boats and 10.3% plank built boats and 8.9% were catamarans. An increase of around 1 lakh fisherfolk families was noticed in 2010 compared to 2005. Around 6.4 lakhs of fisher families did not possess any kind of craft, 5.21 lakhs were without any fishing gear and around 5 lakhs had neither. The number of fisher families wherein only women were involved in fishing and allied activities was 41,000 which was a 17% increase of the corresponding 2005 figure. (CMFRI, 2010) With this background let's explore the policies and programmes for women and gender in India.

### **Women and gender in India: An outline of policies and programmes**

Let's look into the gender equality principle in the Indian context. In reality, the principle of gender equality is enshrined in the Indian Constitution in its preamble, fundamental rights, fundamental duties and directive principles. The Constitution not only grants equality to women, but also empowers the State to adopt measures of positive discrimination in favor of women. Within the framework of a democratic polity, our laws, development policies, plans and programmes have aimed at women's advancement in different spheres. From the Fifth Five Year Plan (1974-78) onwards has been a marked shift in the approach to women's issues from welfare to development. In recent years, the empowerment of women has been recognized as the central issue in determining the status of women. The National Commission for Women was set up by an Act of Parliament in 1990 to safeguard the rights and legal entitlements of women. The 73<sup>rd</sup> and 74<sup>th</sup> Amendments (1993) to the Constitution of India have provided for reservation of seats in the local bodies of Panchayats and Municipalities for women, laying a strong foundation for their participation in decision making at the local levels. However, there still exists a wide gap between the goals enunciated in the Constitution, legislation, policies, plans, programmes, and related mechanisms on the one hand and the situational reality of the status of women in India, on the other. This has been analyzed extensively in the report of the Committee on the Status of Women in India, "Towards Equality", 1974 and highlighted in the National Perspective Plan for Women, 1988-2000, the Shramshakti Report, 1988 and the Platform for Action, Five Years After an

assessment. Gender disparity manifests itself in various forms, the most obvious being the trend of continuously declining female ratio in the population in the last few decades. Social stereotyping and violence at the domestic and societal levels are some of the other manifestations. Consequently, the access of women particularly those belonging to weaker sections including Scheduled Castes/Scheduled Tribes/ Other backward Classes and minorities, majority of whom are in the rural areas and in the informal, unorganized sector – to education, health and productive resources, among others, is inadequate. Therefore, they remain largely marginalized, poor and socially excluded.

Looking into the true perspective of the National Policy, it can be observed that the national policy goal is to bring about the advancement, development and empowerment of women. The policy prescriptions emphasize on a legal-judicial system which will be made more responsive and gender sensitive to women's needs, especially in cases of domestic violence and personal assault. Women's equality in power sharing and active participation in decision making, including decision making in political process at all levels will be ensured for the achievement of the goals of empowerment. Policies, programmes and systems will be established to ensure mainstreaming of women's perspectives in all developmental processes, as catalysts, participants and recipients. Wherever there are gaps in policies and programmes, women specific interventions would be undertaken to bridge these. The dimension of Economic Empowerment of women in the national policy takes care of 'Poverty Eradication', since women comprise the majority of the population below the poverty line and are very often in situations of extreme poverty, given the harsh realities of intra-household and social discrimination, macroeconomic policies and poverty eradication programmes will specifically address the needs and problems of such women. In order to enhance women's access to credit for consumption and production, the establishment of new, and strengthening of existing micro-credit mechanisms and micro-finance institution will be undertaken so that the outreach of credit is enhanced. Women's perspectives will be included in designing and implementing macro-economic and social policies by institutionalizing their participation in such processes.

The gender impact of globalization has not been systematically evaluated fully, as it has presented new challenges for the realization of the goal of women's equality. In view of the critical role of women in the agriculture and allied sectors, as producers, concentrated efforts will be made to ensure that benefits of training, extension and various programmes will reach them in proportion to their numbers. The programmes for training women in soil conservation, social forestry, dairy development and other occupations allied to agriculture like horticulture, livestock including small animal husbandry, poultry, fisheries etc. will be expanded to benefit women workers in the agriculture sector. The important role played by women in electronics, information technology and food processing and agro industry and textiles has been crucial to the development of these sectors. The provision of support services for women, like child care facilities, including crèches at work places and educational institutions, homes for the aged and the disabled will be expanded and improved to create an enabling environment and to ensure their full cooperation in social, political and economic life.

Now let's look into the paradigm of Social Empowerment. The Social Empowerment dimension of women primarily ensures the equal access to education for women and girls. Special measures are being taken to eliminate discrimination, universalize education, eradicate illiteracy,

create a gender-sensitive educational system, increase enrolment and retention rates of girls and improve the quality of education to facilitate life-long learning as well as development of occupation/vocation/technical skills by women. A holistic approach to women's health which includes both nutrition and health services will be adopted and special attention will be given to the needs of women and the girl at all stages of the life cycle. The reduction of infant mortality and maternal mortality, which are sensitive indicators of human development, is a priority concern. In view of the high risk of malnutrition and disease that women face at all the three critical stages viz., infancy and childhood, adolescent and reproductive phase, focused attention would be paid to meeting the nutritional needs of women at all stages of the life cycle. The needs of women in the provision of safe drinking water, sewage disposal, toilet facilities and sanitation within accessible reach of households, especially in rural areas and urban slums also are being considered. Women's perspectives will be included in housing policies, planning of housing colonies and provision of shelter both in rural and urban areas. Women will be involved and their perspectives reflected in the policies and programmes for environment, conservation and restoration.

Now comes to the relevance of Science and technology dimension. Programmes will be strengthened to bring about a greater involvement of women in science and technology. These will include measures to motivate girls to take up science and technology for higher education and also ensure that development projects with scientific and technical inputs involve women fully. In recognition of the diversity of women's situations and in acknowledgement of the needs of specially disadvantaged groups, measures and programmes are being undertaken to provide them with special assistance. All forms of violence against women, physical and mental, whether at domestic or societal levels, including those arising from customs, traditions or accepted practices shall be dealt with effectively with a view to eliminate its incidence. All forms of discrimination against the girl child and violation of her rights are being eliminated by undertaking strong measures both preventive and punitive within and outside the family. Media will be used to portray images consistent with human dignity of girls and women.

Let's also have glance on the operational strategies of Centre and state departments for women and child development. The operational strategies include all central and State Ministries to draw up time bound Action Plans for translating the Policy into a set of concrete actions, through a participatory process of consultation with Centre/State Departments of Women and Child Development and National/State Commissions for Women. Institutional mechanisms, to promote the advancement of women, which exist at the Central and State levels, will be strengthened. National and State Councils will be formed to oversee the operationalization of the Policy on a regular basis. National and State Resource Centers on women will be established with mandates for collection and dissemination of information, undertaking research work, conducting surveys, implementing training and awareness generation programmes, etc. While institutions at the district level will be strengthened, at the grass-roots, women will be helped by Government through its programmes to organize and strengthen into Self-Help Groups (SHGs) at the Anganwadi/Village/Town level. Gender Sensitization training programmes of personnel of executive, legislative and judicial wings of the State, with a special focus on policy and program framers, implementation and development agencies, law enforcement machinery and the judiciary, as well as non-governmental organizations are being undertaken. The 73<sup>rd</sup> and 74<sup>th</sup> Amendments (1993) to the Indian Constitution have

served as a breakthrough towards ensuring equal access and increased participation in political power structure for women. The involvement of voluntary organizations, associations, federations, trade unions, non-governmental organizations, women's organizations, as well as institutions dealing with education, training and research will be ensured in the formulation, implementation, monitoring and review of all policies and programmes affecting women. The Policy will aim at implementation of international obligations/commitments in all sectors on empowerment of women such as the Convention on All Forms of Discrimination against Women (CEDAW), Convention on the Rights of the Child (CRC), International Conference on Population and Development (ICPD) and other such instruments for the empowerment.

Now let's look into the context of empowerment. Speaking the women empowerment paradigm, according to Kieffer [1], empowerment is an interactive process which occurs between the individual and his environment, in the course of which the sense of the self as worthless changes into an acceptance of the self as an assertive citizen with sociopolitical ability. The outcome of the process is skills, based on insights and abilities, the essential features of which are a critical political consciousness, an ability to participate with others, a capacity to cope with frustrations and to struggle for influence over the environment. There is a point of view that women's empowerment may mean the loss of privileged position that patriarchy allotted to men. But as a prelude to this view, women's empowerment also liberates and empowers men, both in material and psychological terms. Women provide new insights, leaderships and strategies. Struggle of women groups for access to material resources and knowledge directly benefit men and children of the families and communities and a better quality of life. When women become equal partners, men are freed from the roles of gender stereotyping which limit their potential personality development in men as much as in women. In addition to losing traditional privileges they also lose traditional burdens.

In simplified terms, women empowerment is a 'bottom-up' process of transforming gender power relations, through individuals or groups developing awareness of women's subordination and building their capacity to challenge it. Empowerment basically refers to the process of raising women status by way of promoting economic, social, political and local empowerment. Empowerment is a process of awareness and capacity building leading to greater participation to greater decision making powers and control and to transformative action. The goals of women empowerment are to challenge patriarchal ideology, to transform the structures and institutions that reinforce and perpetrate gender discrimination and social inequality and enable poor women to gain access to and control over both material and information resources. The paradigm of empowerment means increasing the social, political, spiritual or economic strength of individuals and communities. A lot has already been echoed in the mainstream media and research perspective about the significance that gender equality and empowerment of women play in the overall modernization of any society. Empowering women in a society where they have been treated like doormats for centuries is a Herculean task. There is bound to be an internal resistance practically. It would be pertinent to make an attempt for the practical empowerment of women in the context of community development.

International Fund for Agricultural Development (IFAD) considers three pillars to achieve gender equality and women's empowerment, which include economic empowerment, decision-making and well-being. Let's explore each component in brief.



- **Economic empowerment:** Improving women's access to income-earning opportunities and productive assets. Improving rural women's economic status and helping them build an asset base contribute to breaking down gender stereotypes. Eliminating the barriers that prevent women from getting access to fundamental assets is crucial for broad-based economic growth and poverty reduction.
- **Decision-making:** Increasing women's say in community affairs and strengthening women producers' organizations. Rural poor people need to be able to influence the public and private decisions that affect their lives, if change is to be sustainable.
- **Well-being:** Improving access of rural people, in particular women, to basic services and infrastructure. Rural women give high priority to basic needs such as health services, water, education and infrastructure when consulted during planning of development initiatives. IFAD recognizes that lack of, or limited access to, essential services and infrastructure is a major obstacle to women's advancement because it prevents them from participating in the mainstream of economic development and community life.

### **Aquaculture development policies and programs in India**

India ranks third in capture fisheries and second in aquaculture among the Asian countries. The production from marine sector has almost attended the plateau whereas aquaculture has a great potential. Fish is the cheapest source of animal protein. Fisheries wealth of India is a huge bonanza. It has emerged as a giant industry. Its vast and varied fisheries resource includes 8129 km coastline, 29000 km length rivers which includes 14 major river system, 44 medium rivers and innumerable small rivers and desert streams; 2,013,213 ha of flood plain lakes; 3.1 million ha of reservoirs, 2.254 million ha ponds and tanks and in the coastal area 1.2 million ha has been identified as potential resources for finfish and shellfish. This vast resource provides lifeline to more than 14 million people. About 3651 coastal villages' economy depends on fisheries activities. In India fisheries sector provides employment to over 12 million people engaged fully, partially or in subsidiary activities and play a major role in Indian economy. Women constitute nearly 50% of the total population and one third of labor force Fisheries contributed about 5% of Indian's GDP and about one per cent of the total GDO during 2008-09. The sector supports livelihood options for about 40 million people in India. The marine fishery resources of the country include a coastline of 8129 km with numerous creeks and saline water areas, an Exclusive Economic Zone (EEZ) of 2.02 million km<sup>2</sup> which are suitable for capture as well as culture fisheries. The annual harvestable marine fishery resources in the Indian EEZ have been estimated at about 3.93 million tones constituting more than 50% demersal, 43% pelagic and 6% oceanic groups [2]. The Indian fish production is contributed by marine and inland sectors.

An examination of women's role in the Indian fisheries context reveals that, being an important stakeholder of fisheries sector women shoulders various roles. Traditionally fisher women (women belonging to particular caste, sub-caste, etc.) are important stakeholders in fish processing and marketing. With increase in awareness level among women on economic activities and dissemination of aquaculture techniques, rural women from other caste have joined the fishery sector. Now we find women besides their reproductive roles, assumed

new roles in scientific fish culture, processing and marketing. Women constitute 50% of the total population and comprise one-third of the labour force. So the development of our country cannot be assured leaving behind this large population. Though it is largely accepted that the role of women in fisheries sector is limited to processing and marketing, then role in other activity like aquaculture cannot be totally ignored. On other hand their participation in this sector is needed to be strengthened for better production. The fisheries activities are broadly categorized into capture and culture and the processing is coming up as a separate industry. The resources under capture and culture include – marine, brackish and fresh water. Whereas capture fisheries dominate the marine sector, culture activity dominates inland waters. During last five decades the fisheries sector witnessed a continuous rise with a paradigm shift in the production scenario from that of marine to inland fisheries and aquaculture is gaining priority over capture fisheries. Production of fish from capture sector (with marine and fresh water) has been stagnant for nearly a decade. Hence, the demand shifted automatically to the aquaculture. Aquaculture has shown a continued expansion since 1980s and established a better position among food production sector. Its growth rate registered more than 6%, which is higher to the production of food grains, milk, eggs and many other food items.

As in allied sectors of agriculture, women participation in aquaculture remains largely unnoticed. When the question of adoption of new technology comes the women are rarely considered a target group. But since women constitute 50% of total population, negligence to bring them to the front line action is always a negative approach to the total development process. It is estimated that women carry out almost 70% of agricultural workload, but in aquaculture, their role has not been properly identified. May be it is due to the ignorance of women about the technology, cultural and social barriers, women perception and so on. Women's role in fisheries is very significant and there is gender bias in respect of their works. This discrimination may be noted out from the country's scenario through the economic upliftment of fisherwomen through appropriate policies, programmes and projects. The inequalities between men and women in rural India are observed in the social, cultural and economic lives and are being maintained in the society through various forms of bias. But they are the important stakeholders of our development process. Extension system hardly targets the women folk for technological empowerment. Women participation in fishery sector is age old. But they are still engage in traditional method of processing and marketing. Their participation in culture sector is not yet properly defined. Aquaculture is a developing sector and women participation in this sector needs a meticulous planning for technological empowerment encompassing the social and economic barriers. On farm trials conducted by DRWA, CIFA, CIBA and CMFRI have brought out the strong motivation and capability among women for taking up aquaculture (Freshwater, brackish-water and Marine). Empowering women in different aquaculture practices (Freshwater and brackish-water) can provide suitable option for sustained economic and nutritional security of the family.

### **Mariculture policy framework in Indian scenario**

As this paper highlights the marine fisheries scenario, it would be pertinent to have a look into the mariculture policies of the country. The marine fish production in India during 2010 was estimated at about 3.2 million tones which are more than 70% of the harvestable potential [3]. With the marine capture fisheries reaching a stagnation phase with limited scope for further expansion, the alternative is

to look for augmenting the fishery resources of the sea through Mariculture. The mariculture potential of India is vast as there is great scope for developing farming of shrimps, pearl oysters, mussels, crabs, lobsters, sea bass, groupers, mullets, milkfish, rabbit fish, sea cucumber, ornamental fishes, sea weeds etc. Although about 1.2 million ha is suitable for land based saline aquaculture in India, currently only 13% is utilized. In India till date mariculture activities are confined only to coastal brackish water aquaculture, chiefly shrimp farming. Shrimp is the most demanded product from coastal aquaculture and India is the 5<sup>th</sup> top most shrimp producer from culture. Farmed shrimp contributes about 60% by volume and 82% by value of India's total shrimp export. Share of cultured shrimp export is 78,700 t valued at INR. 3,3000 million. The area under shrimp farming is about 135,000 ha and average production is about 80,000 t/year. In recent years, the demand for mussels, clams, edible oysters, crabs, lobsters, sea weeds and a few marine fin fishes is continuously increasing and brings premium price in the international market. The other activities which can be categorized as artisanal mariculture include green mussel farming, lobster fattening, crab farming, edible oyster culture, clam farming and seaweed culture. Farming of green mussel yields about 4500 t and farmed oysters 800 t, farmed seaweeds about 1000 t while quantities produced are not significant for crabs, lobsters, mullets and milkfish. A flourishing international trade of marine ornamental fishes is also in vogue which offers scope for the culture of several ornamental fishes. Although the techno economic feasibility of several mariculture technologies are already available, lack of adequate infrastructure and lacunae in legislation block their take off [4]. So far, a policy support to govern the mariculture development in a sustainable manner has not been made in the country, In spite of the fast paced developments. As land based aquaculture is generally on private land and there is generally no substantial use of common property resources, an aquaculture lease is not required. Due to pressure from environmentalists, rules and regulation to make shrimp farming sustainable have been put in place by Coastal Aquaculture Authority of India (CAAI) and specific rules have been formed by some maritime states. As per Article 21 of the Indian constitution the states are empowered to regulate and manage marine fisheries in their territorial waters extending 12 nautical miles off the coastline towards the sea and all maritime states have enacted the Marine Regulations Acts since 1980. The area from 12 nautical miles to 200 km in the EEZ comes under the jurisdiction of the Union Government. The provisions made in the 73<sup>rd</sup> and 74<sup>th</sup> amendments to the Constitution of India empower the panchayats to perform functions mentioned in the 11<sup>th</sup> schedule of the constitution in 29 subjects including fisheries. The coastal aquaculture leasing policies

in India have been drafted mainly for shrimp farming particularly in Tamil Nadu. The Govt. of Gujarat has enacted a land lease policy for aquaculture according to which a n individual is admissible for allotment of 5 ha area, co-operative society for 50 ha area while private company is eligible for 100 ha area and allotment is made by the Revenue Departments Authority [5].

### Central legal frameworks

From 1897 onwards various legislations are brought by various agencies and most important legislations include the following and Table 1 shows the Mariculture farming systems prevalent in India

- Indian Fisheries Act, 1897 offering protection to fisheries against explosives
- Indian Ports Act, 1908 relating to port charges
- Merchant Shipping Act 1958,
- The Wildlife (Protection) Act, 1972 (as amended 2002 and 2006),
- Marine Products Export Development Authority Act, 1972,
- Water prevention and Control of pollution act, 1974

The Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976

Marine fishing regulation act, 1978

Forest Conservation Act, 1980

Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981 and the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Rules, 1982

Environment (Protection) Act, 1986,

Coastal Regulation Zone Notification, 1991

Deep Sea Fishing Policy, 1991

Coastal Ocean Monitoring and Prediction Systems, 1991

UNCLOS, 1995: International order or oceans for comprehensive legal framework for integrated treatment of issues relating to oceans and seas.

Coastal Zone Management Plans, 1996

Ocean Observation and information, 1998

No	Resource	Location	Type of farming	Farming status	Status regarding lease
1	Shrimps	Intertidal/sub tidal	Land based (ponds)	Commercial	Lease policies exist in some maritime states guided by rules framed by AAI
2	Oysters	Intertidal/sub tidal Open waters	Off-bottom (Rack and ren)	Commercial (in Kerala)	None
3	Mussels	Intertidal/sub tidal Open waters	On bottom, Off-bottom (Racks, lines, rafts)	Commercial (in Kerala)	None
4	Pearl Oyster	Bay/lagoons/Oceanic open waters	Off-bottom (Rafts and cages)	Experimental (Commercialization Transition Phase)	None
5	Clams	Intertidal/sub tidal Open waters	On bottom	Semi commercial (in Kerala, Karnataka)	None
6	Crabs	Intertidal/sub tidal	Cages/Land based	Commercial fattening/Experimental	None
7	Lobsters	Near shore	Land based (Ponds/cages)	Commercial fattening/Experimental	None
8	Finfishes	Open sea	Sea Cages	Experimental	None
		Coastal	Land based ponds. Fixed cages	Commercial, experimental	Lease policies exist in some maritime states

**Table 1:** Farming systems of Mariculture prevalent in India.

Integrated Coast and Marine Area management (ICMAM Project), 1998

The Biodiversity Bill, 2000

Trade Unions (Amendment) Act 2001,

The Biological Diversity Act 2002,

Comprehensive marine fishing policy 2004

Coastal Aquaculture Authority Act 2005,

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 and Rules, 2007 besides notifications under these.

Wetlands (Conservation and Management) Rules, 2010

Coastal Regulation Zone, Notification January 2011

- The registration of open water body farms and government leasing determines the appropriate areas for Mariculture activity, allocating the rights to use the resource and evaluation of environmental impacts based on certain principles to be considered to frame the Mariculture policy [6].
- Common Property use conflicts: Policy guided by: Use of open water bodies for navigation and fishing should not be hindered by Mariculture. Similarly, Mariculture activities in open water bodies should not cause disturbances to other users. Permitted Mariculture by the state should be afforded complete protection of structure and stock kept in the open water bodies.
- Carrying capacity: Open water bodies have limits to biological productions and such limits should be defined by the state in consultation with research institutions.
- Environmental Protection: The polluter pays principle enacted by the CAAI should be applicable to open water bodies so as to minimize environmental impacts. Pre and Post EIA (Environmental Impact Assessment) is mandatory.
- Conservation: Aquatic ecosystems are very sensitive to changes caused by human activities and hence all activities should take into consideration conservation of aquatic biodiversity.
- Zonation: Since Mariculture in open water bodies diverse and region specific, states have to draw-up zonation plans in GIS formats with the help research institutions. Creation of Mariculture parks should be encouraged.

Data on involvement of men and women in Marine Fisheries and Mariculture. The number of men and women engaged in marine fisheries allied activities are projected in Tables 2 and 3.

A couple of mariculture technologies conspicuously being disseminated by CMFRI with involvement of women and those possessing potential for women's participation are as follows:

### Mussel farming

Raft method (in bays, inshore waters), rack method (in brackish water, estuaries) or long line method (open sea) are commonly adopted for mussel farming *Perna indica* and *P. viridis* Mussel seeds of 15-25 mm size collected from intertidal and sub tidal beds are attached to coir/nylon ropes of 1-6 m length and enveloped by mosquito or cotton netting. Seeds get attached to rope within a few days while the

netting disintegrates. The seeded ropes are hung from rafts, racks or long lines. A harvestable size of 70-80 mm is reached in 5-7 months and production of 12-14 kg mussel (shell on) per meter of rope can be obtained. Attempts to demonstrate the economic feasibility of mussel culture has led to the development of group farming activities in the coastal communities (especially rural women groups) with active support from local administration and developmental agencies like Brackish water Fish Farmers Development Agency (BFFDA) and State Fisheries Department. Sahoo et al., [7] in a recent research study, pointed out the gender participation in different activities, gender needs, decision making and access and control over the resources in respect to mussel culture were analyzed and the socio-economic, technological and export support requirement was analyzed for gender mainstreaming.

### Edible oyster farming

CMFRI has developed methods for edible oyster (*Crassostrea madrasensis*) culture and has produced a complete package of technology, which is presently being widely adopted by small scale farmers in shallow estuaries, bays and backwaters all along the coast. In the adopted rack and ren method, a series of vertical poles are driven into the bottom in rows, on top of which horizontal bars are placed. Spat collection is done either from the wild or produced in hatcheries, on suitable cultch materials. Spat collectors consist of clean oyster shells (5-6 Nos.) suspended on a 3 mm nylon rope at spaced intervals of 15-20 cm and suspended from racks, close to natural oyster beds. Spat collection and further rearing is carried out at the same farm site and harvestable size of 80 mm is reached in 8-10 months. Harvesting is done manually with a production rate of 8-10 tonnes/ha. Oyster shells are also in demand by local cement and lime industry. The number of farmers and production details is shown in Table [8] of these around 75% of the farmers are women mobilized as Self Help Groups.

**Pearl oyster farming and pearl production:** In India, the marine pearls are obtained from the pearl oyster, *Pinctada fucata*. Success in the production of cultured pearls was achieved for the first time in 1973 by CMFRI Raft culture and rack culture in near shore areas are the two methods commonly adopted for rearing pearl oysters and recently attempts have been made to develop onshore culture methods. Shell bead nucleus (3-8 mm) implantation is done in the gonads of the oyster through surgical incision while graft tissues are prepared from donor oysters of the same size and age group. Implanted oysters are kept under observation for 3-4 days in the labs, under flow through system and then shifted to the farm in suitable cages for rearing. Periodic monitoring is done and harvest is carried out after 3-12 months. Pearls are categorized into A, B and C types depending on color, luster and iridescence. 25 percent pearl production has been successfully demonstrated in a series of farm trials at various locations along the Indian coast. Research is also directed towards development of a technology for in vitro pearl production using mantle tissue culture of pearl oyster. The technology for mass production of pearl oyster seed and pearl production has paved the way for its emergence as a profitable coastal aquaculture activity at certain selected centers along the coast. Village level pearl oyster farming and pearl production, through direct involvement of small scale fishermen have been carried out successfully as part of technology transfer program along the Valinokkam Bay on the east coast. Pearl oyster farming has already generated income worth US \$ 26,000 and several young women who are trained in pearl surgery in pearl farms are finding ready employment in this developing industry. The CMFRI also imparts training on pearl culture to trainees in neighboring Asian



countries, and various Memorandum of Understanding (MoU) have been signed with entrepreneurs, desirous of pearl culture since 1996. Success has been obtained in the production of maybe pearls and tissue culture of pearls. Success was achieved in the organ culture of mantle of pearl oyster and abalone. A breakthrough has been achieved by developing a tissue culture technology for marine pearl production using the pearl oyster *Pinctada fucata* and abalone *Haliotis varia* for the first time in the world. This technology can be easily extended to other pearl producing mollusks and gives ample scope for manipulation of pearl quality and also increased pearl production. Maybe pearl production was standardized for production of base images with ten different types of moulds. Technology for production of jewelry from maybe pearl was also standardized.

### Clam culture

Package of clam culture practices has been developed for the blood clam *Anadara granosa* and *Paphia malabarica*, where production of 40 tonnes/ ha/6 months and 15-25 tonnes/ha/4-5 months have been achieved in field trials. Induced spawning and larval rearing to setting of spat has been perfected for clams like *P. malabarica*, *Meretrix meretrix* and *Marcia opima*.

### Crab farming/fattening

Live mud crabs (*Scylla serrata*, *S. tranquebarica*) being a much sought export commodity, mud crab fattening was considered the best alternative. Seed stock consist of freshly moulted crabs (water crabs) of 550 g which are stocked in small brackish water ponds at a stocking density of 1/sq. m or in individual cages for a period of 3-4 weeks while being fed thrice daily with trash fish @ 5-10 percent of their biomass. Selective harvesting is done according to size, growth and demand and the venture is profitable because of low operating costs and fast turnover. Monoculture (with single size and multiple sizes stocking) and polyculture with milkfish and mullets are being carried out on a small scale, as the seed supply is still mainly from the wild. Experiments on breeding and seed production of *S. tranquebarica* have given 20 percent survival rate from egg to first instar stage and attempts are on to improve the survival rate for an economically viable hatchery technology. Hatchery technology for breeding and seed production of the blue swimming crab, *Portunus pelagicus*, has also been developed and four generations of crabs have been produced by domestication. The hatchery seed is being mainly utilized for stock enhancement programs along the east coast.

### Lobster farming and fattening

Increasing demand for live lobsters and crabs in the export market led the farmers and entrepreneurs to collect juvenile lobsters and crabs from the wild and grow to marketable size in ponds and tanks by feeding trash fishes and other discards. In many maritime states juvenile lobsters, *Purulei* of *Panulirus homarus*, *P. ornatus*, *P. poyphagus* and *Thenus orientalis* are grown in captivity and the eyestalk ablated lobsters attained 180-200 g in 5-6 months period. This type of lobster fattening at a stocking density of 10-15 young ones per square meter yielded appreciable growth rates with a profit margin of INR. 50,000/- from a pond of 70 m<sup>2</sup>. Recently major breakthrough in breeding and hatchery production of two species of scyllarid lobsters, *Thenus orientalis* and *Scyllarus rugosus* was achieved by CMFRI. Successful hatchery production of seeds of *T. orientalis* was accomplished for the first time in India and is the second instance globally.

### Sea cucumber culture

More than 200 species of sea cucumbers are found in Indian waters mainly in the Gulf of Mannar, Palk Bay and Andaman and Nicobar Islands. The most important commercial species is *Holothuria scabra*, whose continuous exploitation has led to depletion of natural population. Seed of *H. scabra* was produced in the hatchery for the first time in India in 1988 through induced spawning using thermal stimulation and has been used widely since then to produce seed for stock enhancement programs. Water quality is the most important parameter in hatcheries with ideal conditions being temperature, 27-29°C; salinity 26.2-32.7 ppt, dissolved oxygen 5-6 ml/l; pH, 6-9; and ammonia content, 70-430 mg/cubic metre. Larvae require different diets at different developmental stages and algae like *Isochrysis galbana*, *Chaetoceros calcitrans*, *Tetraselmis chuii* and *Sargassum* are used. Seed produced in hatcheries are grown in velon screen cages (2 sq m area), netlon cages (1.65 sq. m area, 5 mm mesh net), concrete rings (70 cm dia x 30 cm height) and also at the bottom of prawn farms. Artificial diets prepared with soyabean powder, rice bran and prawn head waste is used for feeding juveniles and results are encouraging. Juveniles have been stocked @ 30,000/ha and grown along with shrimps (*P. monodon*) in farms. Sea cucumbers being detritus feeders, feed on waste shrimp feed and organic matter on the pond bottom, reducing the organic pollution load in the farm. Being an eco-friendly practice, which also provides an additional income to the farmer; it is expected to become popular among farmers who have been facing problems of shrimp disease outbreaks in the recent past.

### Marine finfish culture

In the area of marine fish culture, the country is still in the experimental phase only. Attempts are being made to develop suitable hatchery and farming technology for mullets (*Mugil cephalus*, *Liza macrolepis*, *V. seheli*), groupers (*Epinephelus tauvina*), seabass (*Lates calcarifer*), milkfish (*Chanos chanos*) and pearlspot (*Eetroplus suratensis*). The Central Institute of Brackishwater Aquaculture (CIBA) has developed an indigenous hatchery technology for seabass using captive brood stock which were stocked in large RCC tanks (12 x 6 x 2 m) with 70-80 percent water exchange daily. Maturation process was accelerated using LHRH hormone injection and larvae were maintained with rotifers and *Artemia* nauplii. Cooked and minced fish meat is used for nursery rearing and survival rates up to 14 percent in larval rearing phase and 84 percent in the nursery phase have been recorded. Hormonal induction of Broodstock development was achieved in groupers.

### Seaweed culture

Around 60 species of commercially important seaweeds with a standing crop of 100,000 tons occur along the Indian coast from which, nearly 880 tonnes dry agarophytes and 3,600 tons dry alginophytes are exploited annually from the wild. Seaweed products like agar, algin, carragenan and liquid fertilizer are in demand in global markets and some economically viable seaweed cultivation technologies have been developed in India by CMFRI and Central Salt and Marine Chemical Research Institute (CSMCRI). CMFRI has developed technology to culture seaweeds by either vegetative propagation using fragments of seaweeds collected from natural beds or spores (tetraspores/ carpospores). It has the potential to develop in large productive coastal belts and also in onshore culture tanks, ponds and raceways. Recently the culture of the carageenan yielding sea weed *Kappaphycus alvarezii* has become very popular and is being cultivated extensively



State	Marketing	Net making/repair	Curing/Processing	Peeling	Labourer	Others	Total
West Bengal	4,492	7,711	1,936	250	22,872	2,965	40,226
Orissa	21,753	33,734	11,402	1,606	28,007	5,681	102,183
Andhra Pradesh	7,177	22,995	3,795	417	23,903	3,690	61,977
Tamilnadu	5,107	16,775	760	680	22,627	9,328	55,277
Pondicherry	261	610	14	2	646	1,235	2,768
Kerala	4,964	5,500	590	416	15,705	8,447	35,622
Karnataka	1,927	7,690	221	161	7,757	2,527	20,283
Goa	219	475	0	0	501	686	1,881
Maharashtra	4,534	7,618	625	186	8,075	4,465	25,503
Gujarat	4,219	8,532	1,861	1,533	23,304	5,430	44,879
Daman and Diu	17	21	7	0	34	250	329
Total	54,670	1,11,661	21,211	5,251	1,53,431	44,704	3,90,928

**Table 2:** Data of Male Fisherfolk : Gender wise fishing allied activities: (Source: Marine fisheries Census data, CMFRI, 2005).

State	Marketing	Net making/repair	Curing/Processing	Peeling	Labourer	Others	Total	Total male and female
West Bengal	745	7,615	2,769	228	3,279	2,879	17,515	57,741
Orissa	9,938	6,518	16,447	1,561	9,774	6,113	50,351	152,534
Andhra Pradesh	27,160	931	24,524	2,579	31,469	4,252	90,915	152,892
Tamilnadu	31,019	2,276	5,490	1,427	3,030	5,990	49,232	104,509
Pondichery	6,132	20	350	3	68	754	7,327	10,095
Kerala	13,012	4,060	3,291	7,641	1,537	5,911	35,452	71,074
Karnataka	12,400	186	3,121	420	6,286	3,003	25,416	45,699
Goa	1,469	4	0	0	14	14	1,501	3,382
Maharashtra	39,288	1,468	8,584	1,253	3,490	2,194	56,277	81,780
Gujarat	10,666	4,920	1,351	2,777	8,062	2,427	30,203	75,082
Daman and Diu	863	59	4	3	222	123	1,274	1,603
Total	15,2692	28,057	65,931	17,892	67,231	33,660	3,65,463	7,56,391

**Table 3:** Data of Female Fisherfolk: Gender wise fishing allied activities (Source: Marine fisheries Census data, CMFRI, 2005).

Year	Mussel		Oyster	
	Production (tones)	No. of farmers	Production (tones)	No. of farmers
2002	1250	422	350	146
2003	2000	675	500	588
2004	4500	1520	800	564
2005	8600	2865	640	565
2006	10060	3395	1450	663
2007	7894	2664	2150	412
2008	16789	5617	2400	1531
2009	18432	6220	1450	890
2010	19262	6500	2009.7	1312

**Table 4:** Details of Production and Number of Farmers of Mussel and Oyster in India. (Source: Molluscan Fisheries Division, CMFRI).

	SHG1	SHG 2	SHG 3	SHG 4	SHG 5	SHG 6
No. of ropes	500	800	600	750	900	725
Items						
Bamboo	6400	9600	7980	9000	11437	7800
Nylon rope	9954	17500	12000	15000	18000	14500
Coir rope	1100	1500	1200	1587	2000	1450
Cloth	3000	3250	1700	3338	3600	2250
Seed	6500	10000	8700	9000	10800	9770
Labour						
Construction	1600	2400	2170	2250	2700	2200
Seeding	1500	2565	1500	1875	2500	1800
Harvesting	1300	2000	1500	2000	2750	1875
Miscellaneous	1000	1600	1200	1500	1800	1450
Total cost	32,354	50,415	37,950	45,550	55,587	43,095
Returns	40,000	64,000	48,000	60,000	72,000	58,000
Net operating profit	7,646	13,585	10,050	14,450	16,413	14,905
B:C ratio	1.236	1.269	1.265	1.317	1.295	1.346
GDE Index	52.78	54.33	53.91	57.32	55.68	59.14

**Table 5:** Cost particulars of the SHGs' in mussel farming in Kasargod.

Source of Variation	Degrees of freedom	Sum of squares	Mean sum of squares	Variance ratio 'F'
Between groups	11	14368.06	1306.19	18.21**
Error	168	12064.26	71.81	
	179			

\*\*Significant at 1% level of significance

**Table 6:** Analysis of variance in Group Dynamics Effectiveness of SHGs.

Variable No:	Characteristic	Correlation coefficient (r)
1.	Participation	0.947**
2.	Influence and Styles of influence	0.938**
3.	Decision making procedures	0.919**
4.	Task functions	0.907**
5.	Maintenance functions	0.913**
6.	Group atmosphere	0.945**
7.	Membership	0.874**
8.	Feelings	0.879**
9.	Norms	0.884**
10.	Empathy	0.869**
11.	Interpersonal trust	0.918**
12.	Achievements of SHG	0.949**

\*\*Significant at 1% level of significance

**Table 7:** Simple correlation analysis of dimensions of Group Dynamics Effectiveness (n=180).

Variable No.	Characteristic	Correlation coefficient
1	Age	0.087
2	Education	0.310**
3	Occupation	0.058
4	Annual income	0.503**
5	Farm household size	0.508**
6	Fishing experience	0.147
7	Socio-economic status	0.871**
8	Extension orientation	0.840**
9	Scientific orientation	0.813**
10	Mass media participation	0.479**
11	Social participation	0.687**
12	Cosmopolitaness	0.678**
13	Knowledge	0.767**
14	Attitude towards SHG	0.820**
15	Attitude towards intervening agency	0.791**
16	Attitude towards other members	0.782**
17	Information source use pattern	0.847**

\*\*Significant at 1% level of significance

**Table 8:** Relationship of personal and socio-psychological characteristics with GDEI (n=180).

along the Mandapam coast. To make the seaweed industry more economically viable, research aimed at improvement of strains of commercially important species by isolating viable protoplasts and somatic hybridization techniques is being carried out. The rate of production of *Gelidiella acerosa* from culture amounts to 5 tonnes dry weight per hectare, while *Gracilaria edulis* and *Hypnea* production is about 15 tonnes dry weight per hectare. Pilot scale field cultivation of *Kappaphycus alvarezii* carried out in the nearshore area of Palk Bay and Gulf of Mannar showed maximum increase in yield of 4.3 fold after 30-32 days in Palk Bay and 5.7 fold after 22-34 days in Gulf of Mannar. This is a promising venture being undertaken by the women's Self Help Groups in Mandapam. So far as much as 1200 families were engaged in seaweed farming of which 60% of the farmers are women.

## Ornamental fish culture

There are a wide variety of ornamental fishes in the vast water bodies and coral reef ecosystems along the Indian coast, which if judiciously used, can earn a sizeable foreign exchange. A long term sustainable trade of marine ornamental fishes could be developed only through hatchery produced fish. Recently CMFRI achieved breakthrough in developing a package of technologies on broodstock development, captive breeding and larval rearing of 19 species of marine ornamental fishes (Clown fishes 9, Damsels 9 and Dotty backs 1). Amphiprion frenatus and Amphiprion percula were the very important spp of clown fishes.

## Open sea cage farming

Open sea cage farming is a promising venture which offers the fishers a chance for cultivating marine fishes and for optimally utilizing the existing water resources. As and R&D activity, CMFRI launched the first open sea cage 15 m diameter made High Density Poly Ethylene (HDPE) in the bay of Bengal off Visakhapatnam coast during May 2007. The second and third versions of marine cage were all found sea worthy at any extreme sea conditions. For easy management and cost effectiveness in terms of reduced labor, the size of the HDPE cages has been modified to 6 m in the 4<sup>th</sup> version. In a series of demonstration trials, these cages have been found to be successful in many maritime states along the Indian coasts. Latest version of pen sea cage is a cost effective GI cage designed for low investment farming operations found to be suitable in west coasts. Cage culture is a low impact farming practice with high economic returns. The system is eco-friendly without any human intervention, and a higher survival of above 75% was achieved and sustained. The candidate fish species grown in cages are sea bass, red snapper, chanos, mullets, cobia, pompano, groupers, koth, pomfrets, lobsters etc. The mariculture in open sea cage devised under the present invention will expand a new mariculture space, thereby the mariculture scale can be expanded greatly; simultaneously the self-pollution of mariculture can be solved. Now a low cost cage made of GI pipes are also being used in silent bays of west coasts.

## Women Empowerment and Mainstreaming Gender in the Indian Fisheries Context: Selected Case Studies

Development and empowerment of weaker sections and gender mainstreaming in the Indian fisheries sector in a broader visualization

No	Fishery based micro enterprise	Preference Rank of respondents			
		Kasargod	Kannur	Kozhikkod	Malappuram
1.	Preparation of Value Added products	III	V	I	I
2.	Preparation of Dry Fish products	IV	I	III	V
3.	Fish Processing Unit	V	II	II	IV
4.	Ready to eat fish products	VI	VI	V	VI
5.	Ready to cook fish products	VII	VII	VI	VII
6.	Ornamental Fish culture enterprise	VIII	IX	VII	VIII
7.	Mussel culture	I	III	IV	II
8.	Clam collection	XI	IV	IX	IX
9.	Edible oyster culture	II	VIII	VIII	III
10.	Pearl culture	X	XI	XI	X
11.	Mud Crab culture	IX	X	X	XI
12.	Cage culture	XII	XII	XII	XII

**Table 9:** Priority Ranking of fisher folk for fishery based micro enterprises.

No	General Constraints	Rank assigned by respondents (n=180)			
		Kasargod	Kannur	Kozhikkod	Malappuram
1.	Poor living conditions and livelihood security	I	I	I	I
2.	Educational Illiteracy	II	II	II	II
3.	Lack of proper employment	IV	III	III	IV
4.	Socially unorganized set up	III	IV	V	III
5.	Gender inequality	VI	VI	IV	V
6.	Alcoholism of men fisherfolk and exploitation	V	V	VI	VI
7.	Health problems	VIII	VII	VII	VII
8.	Scientifically less advanced	VII	VIII	VIII	IX
9.	Cultural bonding, customs, traditions, conservatism	IX	IX	IX	VIII
	Constraints of SHG	Rank assigned by respondents (n=180)			
10.	Marketing is a tough task	I	I	I	I
11.	Choosing Diversification difficult	III	IV	III	II
12.	Sustenance difficult	IV	II	II	III
13.	Hectic procedures in preparing minutes, reports, meetings, banking etc.	II	III	IV	IV
14.	SHG became an additional burden	V	V	V	V

**Table 10:** Ranking of constraints of women fisher folk: General and SHG level constraints.

Site	No. of SHGs trained	No. of beneficiaries	Method of culture	Size of the rack/raft
Sunkeri of Kali estuary	3	45	Rack culture	5 x 5 m
Majali of Dhandebag	3	45	Raft culture	5 x 5 m
Bhatkal of Mundalli estuary	4	60	Raft culture	5 x 6 m

**Table 11:** Details of Mussel culture trials in Karwar.

SHG	Yield in Kg/m	GDEI score	Correlation coefficient ( r )	't' value
SHG 1	9.2	53.71	0.958139	9.4656248"
SHG 2	9.1	52.31		
SHG 3	8.9	51.91		
SHG 4	12.6	57.32		
SHG 5	12.7	56.68		
SHG 6	12.5	57.14		
SHG 7	13.6	60.01		
SHG 8	13.1	59.98		
SHG 9	13.8	61.29		
SHG 10	13.2	60.02		

**Table 12:** Relationship of yield and GDEI of selected SHGs in Karwar.

will be materialized to a great extent with poverty eradication programs though the transparent media namely Self Help Groups. Self Help Groups can play a vital role for the fisheries sector development. The utmost important requisite for this is ensuring participation of fisher folk especially women in the planning and implementation of various coastal sector development programs. The open access regime existing in the harvesting of marine fishery resources in our country warrants stronger emphasis on invoking technological innovations as well as management paradigms that reconcile livelihood issues with concerns on resource conservation. Being the premier Marine Fisheries Research Institute in India with more than 6 decades of service to the nation, the Central Marine Fisheries Research Institute (CMFRI) suggests ways and means to sustain the potential source of food in capture and culture fisheries and their optimum utilization. Innovations do not happen in a socio-political vacuum. It is the extent of partnership between the research and the client system that decides the fate of any technology in terms of its adoption or rejection. Rational utilization of common property resources for sustainable development without endangering the environment is possible through community participation. Bivalve farming (especially mussel and oyster culture) offers good scope for development in our open waters for enhancing food and livelihood security of the stakeholders in our coastal agro climatic zones. Mussel

farming has already been proved as one of the profitable enterprises in the coastal belts as a subsidiary income-deriving source of coastal fisher folk. The experimental trials conducted by CMFRI have proved the techno-economic feasibility of mussel farming [9-11]. Here an attempt has been made on exploration of three case studies in Kasargod and Kollam districts of Kerala and Karwar of Karnataka on dynamics of Self Help Groups of fisher folk engaged in Mussel Farming (Table 13).

A Self Help Group (SHG) consists of members linked by a common bond like caste, sub-caste, community, place of origin, activity etc. The Group Dynamics of these SHGs refer to the interaction of forces between the members. It is the internal nature of the groups as to how they are formed, what their structures and processes are how they function and affect the individual members and the organization [12]. In an intensive study of Group Dynamics, Pfeiffer and Jones [13] identified the Group Dynamics factors as to how the group is organized, the manner in which the group is led, the amount of training in membership and leadership skills, the tasks given to the groups, its prior history of success or failure etc. In a detailed study of Group Dynamics, Hersey and Blanchard [14] gave emphasis on helping and hindering roles individuals play in groups such as establishing, aggressive, persuading, manipulative, committing, dependent, attending and avoidance. As much as ten success case studies on dynamics of Self Help Groups and empowering

Sl. No	Parameter	Kasargod	Kollam
1	Length of the Coast line	70 km	37 km
2	No. of Marine Fishing villages	16	27
3	No. of Inland Fishing villages	2	26
4	Marine Fisher folk population 2004-2005	45989	96703
5	Active marine fishermen	10566	21368
6	Inland Fisherfolk population 2004-2005	1004	36653
7	Active inland fishermen	435	6255
8	No. of Fisheries co-operatives	27	99
9	No. of domestic fish markets	164	324
10	Annual Marine Fish Production 2004-2005	8292 tonnes	143138 tonnes
11	Annual Inland Fish Production 2004-2005	1612 tonnes	10778 tonnes

**Table 13:** Profile of fisheries sector in Kasargod and Kollam districts (Source: CMFRI Census data, 2005).

vulnerable weaker sections engaged in fishery based activities based on practical experience are explored here.

### Case study on mussel farming self help groups of women in Northern Kerala

Kasargod, the extreme north district of Kerala is particularly notable for mussel farming as it has been successfully accomplished by the women's Self Help Groups (SHGs) for the past few years. These groups were given financial assistance in the scheme namely; SGSY (Swarnajayanthi Gramaswa Rosgar Yojana) by the state government which takes care of economic empowerment of weaker sections [9]. Subsidies, bank loans etc are the part and parcel of it and it essentially focuses attention on poverty alleviation through organised Self Help Groups. This programme looks into training, credit, marketing, technical knowledge and basic facilities necessary for the upliftment of the poor to bring them above the poverty line within three years in such a way that they should have a monthly earnings of at least Rs 2000/-. It would be pertinent to have a look into the consequences of adoption and cost dynamics of mussel farming by the women's Self Help Groups in Kasargod district. This study was undertaken in two major panchayaths namely Cheruvathur and Padanna in Kasargod district. The study area, Cheruvathur panchayath has an area of 18.37 km<sup>2</sup> with a population of 24,504 out of which 18,631 people are literate. Agriculture is the main occupation of the majority and about 150 families are engaged in fishing as the main occupation and about 300 families as subsidiary occupation. Similarly, Padanna panchayath has an area of 13.08 km<sup>2</sup> with a population of 17,961 out of which 12,746 people are literate. About 200 families are engaged in fishing as main occupation and about 400 families as part time occupation. The brackish water estuary systems of these panchayaths are extremely suitable for mussel culture.

Six Self Help Groups of women (three each from both panchayaths) mobilized under the scheme DWCRA, sustained and supported by the technological assistance of CMFRI were selected as the sample and the data were gathered as explorative case studies through personal interviews of the respondents. For the study, the Group Dynamics of members of Self Help Groups was measured by developing an index called Group Dynamics Effectiveness Index (GDEI) which was operationally defined as the sum-total of the forces among the member of SHG based on the twelve sub-dimensions identified such as participation, influence and styles of influence, decision making procedures, task functions, maintenance functions, group atmosphere, membership, feelings, norms, empathy, interpersonal trust and achievements of SHG [15]. All these 12 dimensions were measured by a

set of inventories containing appropriate questions [13] the total score of GDEI for an individual was obtained by adding the individual scores of each component together.

**Profile of cost estimates of mussel farming:** The major expenditure required for mussel farming is for the materials such as bamboo, nylon rope, coir, cloth, seed, etc. and labour costs essentially cover construction, seeding, harvesting etc. The women's groups constituted in the scheme DWCRA started mussel farming as early as 1996-97 and are assisted by loan amount worth Rs 8800/- per member with a subsidy amount worth Rs 4400/- which looks quite fascinating. The duration of the loan is 5 years and the rate of interest is 12.5% per annum. In addition to this, a revolving fund of Rs 5000/- was also provided without interest. When the SHGs are economically empowered with the provision of loan facilities, the returns from mussel farming help them to repay the loan slowly. The loan was granted through Farmers' Service Cooperative Banks and North Malabar Gramin Banks in Cheruvathur and Padanna panchayaths of Kasargod district. Majority of the SHGs showed considerable progress in repayment of the loans, which can be concluded as an indication of the profitability of Mussel farming. The expenditure details of the selected SHGs in the initial year of mussel cultivation are shown in the Table 5 [9]. The Net Operating Profit in all the six SHGs was computed and found as substantially good which proves the profitability of Mussel farming in the initial trial itself and since during the subsequent years, material costs such as those of bamboo, rope, cloth and labour cost in construction etc. are negligible, this ensures reasonable profit as a major consequence of adoption of Mussel farming enterprise bringing about economic empowerment of rural women through organised Self Help Groups.

A proportional relationship is also observed between B:C ratio and GDE index in the table. Experiences and observations already indicated that for a group to be developed as an SHG, it requires a period of at least 36 months and it is a hectic process. It has to pass through various phases such as Formation phase, Stabilization phase and Self Helping phase. These Self Help Groups promote a cooperative and participative culture among the members, which ensures the empowerment culture of the Self Helping phase. The loan sanctioning, utilization, accounts maintenance and timely repayment of loans etc. are all perfectly accomplished with proper maintenance of the documented records by the group members. This ascertains the fulfillment of norms and standards of the SHG leading to economic empowerment of the members.

### Case study of malabar fisheries sector women's self help groups

This case study also covered four districts of north Kerala. The contribution of women in fisheries sector is substantial, especially in various subsidiary activities of capture fisheries such as processing, value addition, sorting, grading, peeling, trading and aquaculture practices ranging from breeding and rearing of fish to marketing. The coastal fishing communities are almost solely depending on the sea resources for their livelihood and the roles that Self Help Groups of women fisher folk in the marine fisheries sector mobilized with a suitable micro-enterprise in fisheries and diversified sectors are pivotal for the maintenance and economic prosperity of their families. Microfinance institutions play a vital role in reducing the coastal indebtedness in marine fisheries sector [16]. Women households are the real victims of deprivation and destitution. Therefore, any program for poverty alleviation must aim at improving the living environment



of the womenfolk. It is through creating livelihood opportunities Poverty alleviation schemes based on micro-credit system have been implemented in many of the developing countries in recent years. In all developing countries state actions are being reinforced in streamlining poverty alleviation programs. The institutional formations of various means are also invigorated for initiating schemes of poverty alleviation successfully [17,18]

It is a matter of great concerns that, despite the economic and socio cultural significance of fishing in Kerala state, the women fisher folk at large are outside the mainstream of the society in the economically disadvantaged category without accruing the benefits from fishing industry [19]. Malabar areas of Kerala always stand backward and less progressive than the rest of Kerala and about half of the coastline of Kerala state is of Malabar [20]. But fisher folk especially women rarely gain the benefits even when there is tremendous consideration for fish production because fisheries development was most often discriminated from the development of fishing community. The Self Help Groups (SHGs) organized by women fisher folk do play a vital role in fisheries sector of maritime states of Indian coastal belts. As it was felt as pertinent to have a look into the group dynamics of the existing Self Help Groups mobilized by the development agencies for empowerment of women fish workers in Malabar fisheries sector, an attempt was made to elucidate a case study on this. The SHGs' whether is a temporary phenomenon, or would continue on a sustainable basis was analyzed and probed [21]. The constraints were to be addressed and empowerment should be brought about by adopting suitable economically viable micro enterprises in fisheries and allied sectors by strengthening of these SHGs.

This case study in Malabar essentially focused on the major objective of assessing the Group Dynamics of the SHGs of women fisher folk and identifying the important dimensions contributing to their effectiveness and assessing the influence of personal and socio psychological characteristics on Group Dynamics. It also took care of assisting in empowerment of women's SHGs through training and adopting economically viable micro enterprises in fisheries and diversified sectors and elucidating success cases of SHGs and identifying the constraints faced by the women fisher folk and thereby developing a strategy for mobilizing and strengthening an effective SHG. The study was undertaken in 4 districts in Malabar of Kerala state namely Kasargod, Kannur, Kozhikkode and Malappuram. From each of the district, 3 SHGs of women fisher folk at random were selected, comprising a total of 12 SHGs. From each SHG, 15 women were personally interviewed by a pre tested interview schedule. The Group Dynamics of each SHG was quantified the index GDEI, The total score of GDEI for an individual was obtained by adding the individual

scores of each component together. The ANOVA Table 6 revealed a significant difference in the GDEI between the selected groups.

**Influence of dimensions of group dynamics effectiveness:** The relationship of dimensions of Group Dynamics Effectiveness with GDEI was established in this study first by simple correlation analysis to identify the most important dimensions (Table 7).

A perusal of the Table 14 indicated that, out of 12 dimensions, the degree of relationship with GDEI was maximum in the case of Achievements of SHG, followed by Participation and Group atmosphere.

**Influence of personal and socio-psychological characteristics:** Among the 17 identified personal and socio-psychological characteristics, it was found from the Table 8 that, 14 variables viz., education, annual income, farm household size, socio-economic status, extension orientation, scientific orientation, mass media participation, social participation, cosmopolitans, knowledge, attitude towards SHG, attitude towards intervening agency, attitude towards other farmers and information source use pattern were positively and significantly related with the dependent variable "Group Dynamics", at one per cent level of significance. However, it was seen that three variables namely age; occupation and fishing experience did not have any significant relationship with the dependent variable.

Steps were taken subsequently to empower those groups with lowest score of GDEI and success case studies on empowerment of women's SHGs' were elucidated from those groups with highest score of GDEI in each district of Malabar. Empowerment programs were undertaken in each district for the SHG with lowest score on GDEI on suitable micro enterprises in fisheries and allied sectors, based on the preference ranking of the SHGs. Preference ranking of micro enterprises according to location specific suitability in fisheries and allied sectors in all the 4 districts was done and appropriate micro enterprises were listed out.

**Micro enterprises in fisheries and diversified sectors:** Empowerment programs were undertaken in each district for the SHG with lowest score on GDEI on suitable micro enterprises in fisheries and allied sectors, based on the preference ranking of the SHGs. Preference ranking of micro enterprises according to location specific suitability in fisheries sector in all the 4 districts was done and appropriate micro enterprises were listed out (Table 9).

A perusal of the Table 9 reveals the potential of bivalve farming, processing, drying and value addition as fishery based micro enterprises. In bivalve farming, mussel culture has immense potential in Malabar fisheries sector [9]. Table 9 reveals that among agricultural based enterprises vegetable farming, ornamental gardening and floriculture

SHG	Cost (Rs)	Returns (Rs)	BC Ratio	GDEI score	Correlation coefficient (r)	Significance (2-tailed)
SHG 1	32,355/-	40,000/-	1.236	52.78	0.863 <sup>***</sup>	0.001
SHG 2	50,415/-	64,000/-	1.269	54.33		
SHG 3	37,950/-	48,000/-	1.265	53.91		
SHG 4	45,550/-	60,000/-	1.317	57.32		
SHG 5	55,590/-	72,000/-	1.295	55.68		
SHG 6	43,095/-	58,000/-	1.346	60.08		
SHG 7	32,000/-	42,000/-	1.312	59.14		
SHG 8	31,750/-	40,500/-	1.275	57.78		
SHG 9	32,500/-	42,000/-	1.292	59.16		
SHG 10	32,850/-	44,500/-	1.354	60.17		

**Table 14:** Relationship of Benefit Cost particulars and GDEI of selected SHGs.

are of greater preference in Malabar. Among allied sector micro enterprises, grocery repacking, garments unit etc. had tremendous potential. A micro enterprise is an activity which requires less capital, less manpower, local raw materials and local market. It is an individual enterprise whether known or unknown [22]. Preference ranking based on the suitability of the locations in Northern coastal belts of Kerala for 12 fishery based micro enterprises, 15 agri-based micro enterprises and 15 allied sector micro enterprises also were undertaken. In fisheries sector, for the upliftment of fisher folk below the poverty line, some successful micro enterprises developed based on the location specific resource availability and experience and some alternate avocations and subsidiary entrepreneurial ventures successfully being undertaken by Self Help Groups in coastal sectors and allied areas as follows: Value added fish producing units, Dry fish unit, Fish Processing unit, Ready to eat fish products, ready to cook fish products, Ornamental fish culture, Mussel culture, Edible oyster culture, Clam collection and Cage farming are very important. In agricultural sector, Vegetable cultivation, Ornamental gardening, Floriculture, Kitchen Garden, Orchards, Fruit products, Fruit processing, Sericulture, Mushroom cultivation, Medicinal Plants, Vermi-compost, Snacks units, Catering Units, Bakery Units, Cereal Pulverizing units are some micro enterprises undertaken by women's Self Help Groups [23].

Based on the resource availability and circumstances the micro enterprises those the SHGs can generally bring to practical utility in allied sectors are Wood work units, Stone work units, Soap units, Garment units, Computer centre, Poultry centre, Cattle rearing, Piggery unit, Bee Units, Stitching units, Hand Weaving Units, Candles, Chalks, Umbrella units, Foam Bed Units, Bamboo based handicrafts, Paper cover, Scrape selling, Vegetable seeds, Marriage bureau, Medicine collection, Patients service, Real estate, Medicine processing, Direct marketing, Coir Brush, Plastic weaving, Second sails, Meat masala, Rasam powder, Curry powder, Pickle powder, Sambar powder, Consumer service centres, Home delivery package, Repacking business, Cleaning powder, Phenol lotion, Liquid soap, Washing soap, Toilet soap, Kids' garments, Toffee and Sweets, Photostat, Washing powder of best quality and medium type, Emery powder, Domestic animals, Nursery plants, Note book, Book binding, Rubber slipper production, Pillow cushion, Incense stick production, Cloth whiteners, Eucalyptus oil, Dolls, Hand shampoo, Soap shampoo, detergent shampoo, Jackfruit jam, Chips, Hotel, Catering service, Grape wine, Pineapple wine, Soft drinks, Chicken farming, Dried mango wafer, Dried chilli, Gooseberry wine, Ginger wine, Papads, Tomato sauce, Day care centre, Coconut water vinegar, Syrups, Artificial vinegar, Mixed fruit jam, Milk chocolate, Tomato squash, Gum production, Cleaning lotion, Soft drink shop, Reading room, Private tuition, Counseling-guidance, Rent sales, Paying Guest service, Repairing centre and handicrafts are some of the employment opportunities that the SHGs can venture throughout Kerala depending on the suitability of situations and availability of resources.

The suitability of the micro-enterprise varies from situation to situation. The essential features for the success of a viable micro enterprise are: the availability of sufficient quantity of raw materials locally, the identified enterprise is known or easy to learn and practice, the cost of production must be low, the products must be of very good quality, the availability of market for the products. The important financial organizations giving financial assistance to SHGs are Khadi Village Industries Board, Department of Commerce and Industry, Jawahar Rosgar Yojana, Women Industrial Cooperative Societies, Kerala State Social Welfare Advisory Board, Kerala Financial

Corporation, National bank of Agriculture and Rural Development, District Rural Development Agency, other Non-Government Organizations, Kudumbasree ayalkoottam groups etc.

**Constraints of women fisher folk of Malabar:** The constraints in general as well as those faced by the women fisher folk as members of SHG, as per their order of importance in the perception of respondents in Malabar are presented in Table 10. Rather than the general constraints such as poor living conditions, illiteracy, unemployment etc., more stress was given on the constraints faced by the SHGs' as it is pertinent for the present study. Marketing aspect was perceived to be the biggest constraint of the SHGs' rather than procedural hurdles of preparing minutes, reports, meetings, banking etc. From these priorities and constraints it is obvious that it is high time for diversification of micro enterprise in additional to fishery based ones in these SHGs' for sustenance. Many SHGs of women fisher folk have already diversified in these enterprises in Malabar fisheries sector.

**Developing a strategy for the mobilization of an effective SHG of women fisher folk:** Taking in to consideration of the valid inferences and practical implications drawn from the findings of the study, a strategy for mobilizing and strengthening an effective SHG of women fisher folk was developed by consultation with 6 specialists in social mobilization, 12 leader members of selected SHGs' and 12 officials of intervening agencies. Steps in this strategy in fisheries context are prioritized by these 30 respondents through three phases of group development such as group formation phase, stabilization phase and self-helping phase with critical features at the end of each phase including norms and byelaw. A brief essence of the developed strategy is presented here.

- **Group Initiation/Formation Phase (0 to 4 Months):** The major steps in this phase should include the initial visit to the location, rapport building, interaction, awareness creation, identification of women fisherfolk, introduction meeting, action plan, documentation of deliberations, mobilizing genuine members, subsequent meeting for solutions to problems, action plan for arranging raw materials for the fishery based and diversified micro enterprise, marketing information, fortnightly meetings for progress review, selection of 'leader Fisherwomen' in respect of production, credit and marketing aspects, group discussion, demonstration etc., first basic field training with need assessment for the successive training programs on production technology and management aspects emphasizing the maintenance of SHG registers as facilitator's role.
- **Building up/Stabilization Phase (4 to 15 Months):** This phase must involve regular need based fortnightly meetings, maintenance of documents, practical training of women leaders on production, credit and marketing aspects, scheduled implementation of action plan, procurement of inputs based on market demand, market synchronized production planning, intensive training to carry out activities of production, credit and marketing aspects, training to other members by the leaders and changing the leaders of SHG after one year so that periodic rotation gives the other potential leaders a chance by maintaining the intervening agency's role as 'enabler.'
- **Self-Helping Phase (15 to 36 Months):** The main steps to be included in this phase are development of fortnightly action program, meetings for sharing experiences, refinement,

improvement and problem solving for the activities under the responsibilities of the leaders, limiting the extension personnel's role to a facilitator, gradually reducing their presence at meetings, transactions fully within the SHG under the members themselves, originally active leaders giving way to new leaders after 2 year term, encouraging inter-SHG contacts, arranging contestations e.g. best member or SHG in the site etc., to develop a healthy competition spirit, initiative by leaders to create a sense of group pressure by established norms for defaulters, ensuring participation in every activity for sustenance of SHG, ensuring favorable group atmosphere, functions, empathy and interpersonal trust for significant achievements of SHG, emphasizing the dimensions of Group Dynamics.

### **Case study on mussel farming self help groups in Karwar of Karnataka**

Self Help Groups (SHGs) of fisher folk were mobilized by CMFRI in Karwar and Bhatkal locations of Karnataka coastal belts. Three SHGs of 15 members each comprising a total of 45 were mobilized in Majali (Open Sea) of Dhandebag and three SHGs of 15 members, each comprising a total of 45 were mobilised in Sunkeri of Kali estuary in Karwar coastal belts in Uttara Kannada district of Karnataka state. Training and demonstration on mussel farming was undertaken in these SHGs. Initially, two training and demonstration programmes in these two sites in Karwar were undertaken, one for raft culture in open sea in Majali of Dandebag and one for rack culture in Sunkeri of Kali estuary. The training was imparted to 45 members of three Self Help Groups, each possessing 15 members in 2 sites separately comprising a total of 90 participants. At Majali in open sea, a 5 x 5 metre raft and at Sunkeri of Kali estuary, a 5 x 5 metre rack was constructed for mussel farming. Similarly In Mundalli river of Bhatkal estuary in Karnataka, 4 Self Help Groups of 15 members each exclusively of women fisher folk mobilised under the NGO, 'Snehakunja' comprising a total of 60 participants were trained on mussel farming. They initiated a trial in 5 x 6 metre rack mussel culture by long line method. The sample design for observation including the number of SHGs' trained, beneficiaries and method of culture is given in Table 11.

Data were gathered from these 10 Self Help Groups through personal interviews of the respondents. For the study, the Group Dynamics of members of Self Help Groups was again measured by GDEI. The growth parameters were monitored every week in all the sites and the yield particulars of mussel during harvesting in each SHG was also noted. The major expenditure required for mussel farming is for the materials such as bamboo, nylon rope, coir, cloth, seed, etc. and labour costs essentially for construction, seeding, harvesting etc. The SHGs of Majali and Sunkeri were mobilized by the project team of CMFRI and the SHGs of Bhatkal were mobilized by a NGO namely Snehakunja. The first two trials and demonstrations were under the funding of CMFRI and for the last one, only the technical helps during the training and demonstration were offered by CMFRI. The yield particulars in all the ten SHGs were noted and found as substantially good which proves the profitability of mussel farming in the subsequent trials because the material costs such as those of bamboo, rope, cloth and labor cost in construction etc. are negligible, this ensures reasonable profit as a major consequence of adoption of Mussel farming enterprise bringing about economic empowerment of rural women through organized Self Help Groups.

The mussel farming in the open sea described in this case met with the impediment of unfortunate sabotage of the seeded mussel by some miscreants. It was rectified by reseeded, but the yield was not that much conspicuous compared to the trials undertaken in estuaries. The yield in Kg per metre length of the rope recorded in all SHGs as Average Yield showed a positive relationship with GDEI score [11]. The correlation ( $r=0.958139$ ) was found significant owing to the 't' value 9.465624 at 1% level of significance (Table 8). The utilization of fund sources, accounts maintenance etc. are all systematically accomplished by the group members thereby ascertaining the fulfillment of norms and standards of the SHG leading to economic empowerment of the members. Here also, the positive correlation is observed between Yield and GDEI (Table 12). As one of the major dimensions of GDEI is the achievements of SHG which is an indirect representation of yield and economic gain from the micro enterprise of the SHG, it is quite natural to observe a positive relationship of yield or BC ratio with GDEI.

### **Case study of women's self help groups in Kollam and Kasargod of Kerala in bivalve farming**

A case study was elucidated from the bivalve farming trials undertaken in two panchayats namely Cheruvathur and Padanna in Kasargod district and Thekkumbhagam and Neendakara in Kollam district. Bivalve farming (especially mussel and oyster culture) offers good scope for development in our open waters for enhancing food and livelihood security of the stakeholders in our coastal agro climatic zones. Mussel culture has already been proved as one of the profitable enterprises in the coastal belts as a subsidiary income-deriving source of coastal fisherfolk. The experimental trials conducted by CMFRI have proved the techno-economic feasibility of mussel farming. [9,11,24]. As much as 200 households undertaking bivalve farming were selected and male and female counterparts in each household were separately interviewed, comprising a total of 400 respondents. The data regarding gender participation in different activities, gender needs, decision making and access and control over the resources in respect to bivalve culture were collected through personal interviews of the respondents with the help of a pre-tested well structured interview schedule. In addition to this, 10 women SHGs engaged in bivalve culture, five each from the above districts were randomly selected to measure the Group Dynamics. The Group Dynamics of SHGs was measured by the index GDEI developed by Vipinkumar and Singh [15] with appropriate modifications suitable for the present context. The Benefit-Cost ratio was analyzed in each group and cost estimates were also worked out. The problems and constraints faced by the women were also assessed in each case and listed out.

The relationship of Benefit Cost estimates and GDEI of selected SHGs is presented in Table 14. The study, focused attention on Group Dynamics Effectiveness as a trait of SHGs resulted by the joint influence of individual members of the group generated out of skills and orientations from the past life experiences. It definitely varies from person to person, place to place, time to time, situation to situation and in turn from group to group. This might be the probable reason for the differential degree of GDEI observed among respondents.

**Cost estimates of bivalve farming self help groups:** The women's groups constituted in the scheme Development of Women and Children in Rural Areas (DW CRA) started mussel farming as early as 1996-97 and were assisted by loan amount worth Rs 8800/- per member with a subsidy of 50% of the loan. The duration of the loan is 5 years and the rate of interest is 12.5% per annum. In addition to



this, a revolving fund of Rs 5000/- was also provided without interest. When the SHGs are economically empowered with the provision of loan facilities, the returns from mussel farming help them to repay the loan slowly. The loan was granted through Farmers' Service Cooperative Banks and North Malabar Gramin Banks in Cheruvathur and Padanna panchayaths of Kasargod district. Majority of the SHGs showed considerable progress in repayment of the loans, which may be concluded as an indication of the profitability of mussel farming. The expenditure details of the selected SHGs in the initial year of mussel cultivation are also shown in Table 5. The BC Ratio of SHGs was found as substantially good which proves the profitability of mussel farming in the first crop itself and since in the subsequent years, material costs such as those of bamboo, rope, cloth and labour cost in construction etc. are negligible, this ensures reasonable profit and adoption of mussel farming enterprise bringing about economic empowerment of rural women through organised Self Help Groups.

Experiences and observations already indicated that for a group to be developed as an SHG it requires a period of at least 36 months and it is a hectic process. It has to pass through various phases such as Formation phase, Stabilization phase and Self Helping phase. These SHGs promote a cooperative and participative culture among the members, which ensures the empowerment culture of the Self Helping phase. The loan sanctioning, utilization, accounts maintenance and timely repayment of loans etc. are all systematically accomplished with proper maintenance of the documented records by the group members. This ascertains the fulfillment of norms and standards of the SHG leading to economic empowerment of the members. Table 14 also presents the relationship of Cost estimates and GDEI. The average yield in Kg per meter length of the rope recorded in all SHGs also showed a positive relationship with GDEI score. There was a proportional positive association of BC ratio with GDEI owing to the correlation coefficient value ( $r=0.863$ ). One of the major dimensions of GDEI is achievements of SHG which is an indirect representation of yield and economic gain from the micro-enterprise of the SHGs and therefore it could be a primary factor responsible for a positive relationship of yield or BC Ratio with GDEI.

**Gender perspectives of bivalve farming self help groups:** The gender participation in different activities, gender needs, decision making and access and control over the resources in respect to bivalve culture were analyzed. Opinion of men and women in above aspect was found to be similar without any significant difference. However, differential gender response was observed between the villages in Kasargod and Kollam districts. Significantly, the accounting/money transaction is under the control of women and the most important requirement perceived by both men and women is the timely availability of spat. In case of participation and need, both

men and women share almost the same opinion [7]. Socio-economic, technological and export support requirement was analyzed for gender mainstreaming. Male and female respondents in a household were separately interviewed for getting the response of gender needs in terms of access to resources in mussel/oyster culture, participation in various activities of bivalve farming, gender needs and decision making in various stages. The typology access to resources in bivalve farming in gender response such as female alone, male<female, male=female, male>female and male alone indicated separately for male and female respondents. (Table 15) A perusal of the Table 4 clearly shows the response pattern of male and female separately in access to resources concerned with bivalve farming. Among the responses of female and male for the items of access to resources, most of the items are dominated by 'male alone' except for 'extension services' and 'market Access' which are dominated by 'female alone'. Access to 'extension services' and 'market' by 'female alone' is a commendable significance of mussel farming SHGs mobilized by women.

#### **A success case of Institution-Village-Linkage-Programme (IVLP) for Technology Assessment and Refinement (TAR) in the coastal agro ecosystem of Ernakulam in Kerala**

Another major attempt of empowerment of fisher folk was through the NATP funded project on IVLP with the major targets of assessing the needs and identifying the coastal agro ecology and production system perspectives of technologies in the selected village and introducing improvements in the existing production systems through better scientific management practices to enhance productivity and thereby to improve the farm production systems for refining the technologies for productivity, equitability, stability, sustainability and profitability. The IVLP has been operational at Elamkunnappuzha Village of Vypeen Island in Ernakulam District of Kerala. A total of 687 farm families were involved in the project as participant stakeholders covering a population of 3435. Altogether, 31 techno-interventions were implemented (13 in fisheries, 13 in agri-horticulture, and 5 in livestock) and 15 training programmes were organized for 576 farmers. The linkages developed in this program enabled the stakeholders to sustain and continue their efforts. The impact of this program has been highly appreciated and acclaimed and is now popularly known as "Elamkunnappuzha model of development".

During the last phase, emphasis was given for prioritization of the refined technologies and the following six techno- interventions were selected for horizontal expansion in the state of Kerala such as Monoculture of grey mullet, Monoculture of milkfish, Polyculture of finfish, INM in coconut plantations, Dairy farming with paragrass, Poultry farming with the "Gramalakshmi" breed etc. The projected economic impact for these six technologies, at 25% level of adoption in

Resource Access	Female Alone		M<F		M=F		M>F		Male Alone		No Access	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Craft	24.5	25.13		0.5	2	2.01	12.5	14.57	61	57.79		
Extension Service	37.69	36.87	4.02	2.02	8.04	8.08	24.12	22.73	18.09	21.72	8.04	8.59
Gear	25	24.12		2.01		1.51	14	15.58	61	56.78		
Institutional Credit	26.5	26.63	1.5	1.01	13	11.06	19.5	19.6	39.5	41.71		
Market	23.62	23.74	4.02	2.02	26.63	20.2	27.14	28.79	17.59	23.74	1.01	1.52
Non-Institutional Credit	0.5	1.01	0.5		6.5	4.52	19.5	14.07	21.5	25.13	51.5	55.28
Other Inputs	0.5	1.52	3.5	3.54	11	14.65	35.5	34.34	40.5	39.39	9	6.57
Site/Water	1.5		1.5	0.5	5	5.53	35.5	41.21	56.5	52.76		
Total	17.46	17.37	1.88	1.45	9.01	8.43	23.47	23.85	39.49	39.9	8.7	9

**Table 15:** Access to resources for bivalve farming (n=400).



Kerala state alone was worked out as Rs. 420 crore from an additional production of 60000 t of fish, Rs 220 crore from a surplus milk yield of 1000 t per day, an additional revenue of Rs 12 crore from poultry, and Rs 190 crore from coconut plantations in coastal districts. Many of the interventions initiated by IVLP were sustained by the ATIC of CMFRI as the sales outlet of ATIC provided the platform for selling the items of IVLP units.

### **A success case of women's selfhelp group at Elamkunnappuzha in dry fish processing**

Success case studies were elucidated from such fisherfolk who brought out a remarkable professional achievement, improved earnings and employment. Similarly Self Help Groups mobilized by various micro enterprises with the inspiration and support from ATIC also were taken in to consideration for exploring the success cases. For collecting data for livelihood analysis, the sources were the available existing information, people's perceptions and opinions and observations in addition to personal interview. The livelihood analysis encompasses all the strategies and assets that individuals and households use to earn a living [25-29]. 'Janani' Self Help Group, Puthuvyppu Post, Elamkunnappuzha in Vypeen Island was conspicuous for the intervention of drying of fish through consultation of CMFRI. The group has 15 members and was engaged in the rack drying of fish. Drying of fish was not new to them since they were doing it on individual basis on a limited scale. They used to dry the fish in the traditional way. The President of Janani group, Mrs. Chandramathi Appukuttan says that, she settled at Elamkunnappuzha village after her marriage 20 years back. She became a part of 13-member women-group in 1997. They used to make use of the market surplus of bumper fish catch for drying purpose. The operational cost was less, but they could get very less profit as the unhygienic practices followed at that time caused high amount of wastage of fishes. Most of the dried fish were taken for own consumption. They are also engaged in door-to-door selling of the products. The dried fish was mostly marketed at the local market. She says that, "It is our luck that our group is selected by the ATIC of CMFRI for marketing of the dried fish items. With the advent of this program and inputs of IVLP, we process first quality fish on commercial basis. The products are marketed well in good packing conditions, replacing our earlier paper packing. The training given by the Scientists from CMFRI on dip treatment under IVLP has increased our awareness regarding the hygienic method of drying fishes using 'calcium powder'. They also gave information regarding new marketing outlets. The 'special racks' those were provided for the drying of fish helped us in maintaining the fish products in good condition and reduced the wastage of fish during processing. Now more and more people, especially women are coming forward to take up similar venture.

### **A fisher family's success story at Puthuvyppu in fin fish culture**

Mr. Karthikeyan (48), Thirunilathu, Puthuvyppu, Elamkunnappuzha having primary level of education, was a regular visitor of CMFRI for the technology on 'polyculture of finfish (*Chanos chanos* and *Mugil cephalus*)'. He entered into the field of fish culture during 1996, in his own farm. He owns 42 cents of land. The location was very bushy obstructing the inflow and outflow of saline water from the sea. This resulted in silt deposition and increase in weed population. The bushy land was cleared and deepened for culturing fish. He constructed temporary sluices in the eastern corner of the pond. No additional

labourers were employed; rather the work was done by the family members. His wife Mrs Isha engaged herself fully in the farm operations. Natural entry of various species of gray mullets, pearl spot, milkfish was allowed. Apart from this, selective stocking of *Mugil cephalus* was also done at times. No specific stocking rate was maintained in such selective stocking. The economic returns were very minimal and were inadequate to make both ends meet. Irregular stocking and feeding pattern might be the reason for the low yield and less profit during those periods. He contacted CMFRI and made use of the technologies by becoming a member of IVLP program during 2001. He says that, "I was given training regarding different aspects of finfish farming and I learned the importance of maintaining sluice gates for the proper water exchange. Stocking of fish and their feeding pattern were followed as per the suggestions of Scientists. My income earning from fish culture has increased from Rs. 32,000/- to around Rs. 55,000/-. I could manage to provide good education to my daughters. With no doubt in my mind I proudly say that all this is possible only because of IVLP and ATIC of CMFRI."

### **Crab culture and crab fattening: A fisher family's success story at Malippuram**

Sylvi Figerado (53) (Pathissery, Malippuram Po. Elamkunnappuzha) is a dynamic farmer who took up Crab Monoculture based on CMFRI technology. Figerado, a matriculate, took around 6 acres of pond on lease for shrimp farming. Initially he was interested in active fishing and he was an owner of two boats during 1980s. He could not sustain his fishing business for a long period as he met with heavy losses. His two male children were too young to support him economically during his difficult period. He shifted over to crab culture with the consultation of IVLP team of CMFRI. The regular farm advisory services on crab culture and fattening were offered through the ATIC and his reluctance and negative attitude towards crab farming was totally vanished. His wife Juliet aged 53, supported him in all his farming operations. They were aware of the requirement of proper water exchange, farming, quality seeds for stocking, selection of uniform sized seeds, farm requirements and the feeding pattern. In 2002 they earned a profit of 47,000/- from their pond in a single harvest. In the next lot they earned a profit of more than 50,000/-. That trend continued till date. Now the couple is confident that, whenever they are in need of money, they just sell crabs and get adequate amount all on a sudden. They proclaim that, crab farming is the best technology for obtaining maximum profit without much risk. Now Sylvi and Juliet have diversified the crab culture along with duck farming and vegetable cultivation in homesteads with bittergourd and cowpea. The excreta of ducks became good organic manure for his homestead plot.

### **A Case study on conservation of marine resources: 'Theeram' Turtle protection group of Kolavi Palam at Payyoli**

Kolavi palam beach resorts of Northern Kerala near Payyoli are popular for large gatherings of marine turtles during nesting seasons. A group of young nature lovers joined as 'Theorem Nature Conservation Society' and large number of newspaper clippings appeared about this dynamic group conserving the sea resources. The peculiarities of the 'nature conservation society' when become known everywhere, the Kerala Forest Department, Kerala Forestry Project, Habitat Management of Turtle, NGO's like Malabar Coastal Institute for Training, Research and Action (MCITRA), Central Research Institutes like CMFRI, IISR etc started intervention to make aware the public about the necessity of conserving and managing sea turtles.

Soon, in 1992, the awareness programs clicked and from 1998 onwards the Kerala Forest Department extended assistance by building up two hatcheries and sheds and providing lanterns, torches and daily wages to six members. Soon the activities of the society began to be carried out in an orderly manner after legal registration. They developed it as a breeding location for turtles and they conserve the natural sea resources. The group contacted the ATIC of CMFRI for learning the principles of Responsible Fisheries Management, Protection and conservation of mangroves to retain the biodiversity and sustainability of ecosystem. All the information bulletins on Sustainable Fisheries management, FAO code of Conduct on Responsible Fisheries, Bulletins of National Conferences on Marine turtles and the pamphlets on fishery based technologies were supplied to them by CMFRI. Interactive meetings with the fisherfolk were arranged with active involvement of scientists and technical hands of CMFRI in the Kolavi turtle nesting beach. The group members keep the statistics of the number of eggs hatched per nesting season. But most of the hatcheries disappeared due to severe sea erosion and the seashore breadth has reduced to 350 meters. In spite of all these impediments and obstacles, still the sincere efforts to conserve turtle by the group continue and more than 40,000 hatchlings were released in to the sea [23]. They expect a large arribada in the near future. The President of the group Sri. Surendra babu and Secretary Sri Suresh babu maintain contact with CMFRI for learning the technologies and putting into practice the principles of Sustainable management of marine resources. Interactive discussions with the active members of the group took place in ATIC and in the Theeram location on several occasions. The group planted mangrove seedlings and they are being looked after by the group with extreme commitment for developing natural habitats. The group developed a nursery for forest trees of 35 different species with the help of forest department and about 30,000 seedlings are raised to develop it as a permanent infrastructure. They often organize awareness camps, project movies and conduct slide shows on nature protection and mangrove conservation.

### **Case study on dry fish Market mobilized by women in Marol of Maharashtra**

The dry fish market in Marol situating in the heart of Mumbai city in Versoa district of Maharashtra state is a strong instance for the untiring perseverance for the mobilized women fisher folk in the Indian marine fisheries sector [16]. The present stage of the market was achieved after a long span of repeated fights and agitations against authorities by this mobilized group of women fisher folk which stood for the genuine rights. The largest whole sale market will be running actively on Friday and Saturday where the fish to the tune of 50-60 truck load form Uttan, Versoa, Arnale and such conspicuous locations come to Marol. On Thursdays, trucks form Jafrabad area of Gujarat was common. The commonly handled fishes are acetus, ribbon fish, Bombay duck, etc. Retailers buy it at an approximate rate of Rs 90 to 100/- per kg. It can be on count basis also. Municipality taxes come as extra. Right now, more than 3000 active members are there in Marol Operating Dry Fish market. Weekly each member contributes Rs 10/- for paying the salary of the person looking after the monitoring aspects.

Mrs. Rajasree Prakash Banjee, the President of the Self Help Group and Smt. Jayashree Sadashiv Raje, the Secretary were personally interviewed and a detailed case study was made on the operation of Marol Dry fish market. Mrs. Rajasree Banji, as the representative of Koli community emphasized the basic necessities which encapsulated the community's ire over the apathy of local bodies. The case study explored the long lasting flight of a group of women fisher folk in the

heart of the Mumbai city. The 15 lakh strong koli community has been selling fish in Marol market which was the only whole sale market for dry fish in Mumbai. Consecutive local governments have neglected the development of the market which encompasses approximately 2,000 sq.m. The 2000 women, who sell fish twice a week, have no shelter or concrete platforms. After a good number of meetings and discussions with the politicians an amount of Rs 6 lakhs has been sanctioned for the plastic shelter. Because of the tiresome heat, many of the workers often faint. Moreover, during monsoons, the area becomes slushy and puddles formed breed worms and spoil the fish. The community wanted the government to build a concrete raised platform that will help keep the fish fresh even during rains.

The encroachment of the market land belonging to koli samaj by shop owners outside the community was another problem that plagues them was Severe encroachments by illegal shops, builders etc. took place and people far from outside such as Assam, Nagaland etc use to come and encroach. After a lot of representations, a concrete wall was built around the premises. Still illegal encroachments were common. The temporary tarpaulin sheds existed for 4 to 5 years only. In the meantime, cloth merchants approached the women and gave the idea of constructing a mall in which everything will be available like sari, shoes, bags and they promised that the dry fish market will run below the mall and the other shopping in the upper floors can be done. But the ladies opposed and substantiated that they want only the market. The ladies soon recognized the market soon will disappear because the place is the very heart of Mumbai city. They took initiative to get mobilized in groups to meet Greater Bombay Municipal Corporation (GBM). They travelled everywhere and gave representations wherever required and signed petitions were submitted to authorities to allot that 11000 sq. ft area exclusively for them as the total market place.

It was after fighting for a market for more than a decade, a documentary film was made on their plight and those all finally helped to voice their concern and permanent concrete structures were constructed in Marol fish market separately for different locations. The plight started in 1991 and the society was registered on 6<sup>th</sup> November 2007 to rejuvenate the market. (Marol Bazaar Machchli Vikreta Koli Mahila Sanstha (Registration No: 2570 under Societies Act.) Now, 3,000 members from 9 main fishing areas constituted 38 small villages are there in the market. The nominal membership of Rs 100/- was charged and financial support of fishermen co-operative societies and donors from the villages also helped. But still amenities are to be improved like toilet facility, bathroom, roads etc. About 7 to 8 truckloads of fish from Jafrabad is common and 1 truck carries about 7 tonnes. In total around 50 trucks from these 9 villages use to come to the market. The present focus of the SHG members is to accumulate funds to build road inside compound wall, illumination, water and sanitation facilities. The group also issued photo identity cards to members to designate members to claim exclusive rights for sale of produce in the market and to help protect them from exploitation by middle men. Also it provided livelihood to about 200 hawkers around the fish market. The chain group working system and understanding among the group members for equal sharing of profit even in the absence of any member was a peculiarity. And the group took keen interest in addressing social issues for better cooperation. Building liaison with organized marketing sector in big metros like Mumbai for marketing of value added products was another initiative of the group. The group also attempted to promote business for consumer product. This success case is very indication of a case model which can be used as a practical manual for mobilizing Self Help Groups on a sustainable basis in fisheries sector.

This detailed case study elucidated about Marol dry fish market as a success story can be used as practical manual of social mobilization. As much as 60 women members of the market were personally interviewed for this and a focus group discussion was held with the women leader members of Marol including President and Secretary. The major independent variables were quantified and the average score obtained for the respondents were converted into percentage value and are presented in Table 16.

## Mariculture and Marine Fisheries Sector in India: Gender Issues and Challenges

- One of the biggest constraints in mariculture sector of Indian scenario is the lack of a clear cut policy framework uniformly applicable throughout the coastal belts of the country. Policies need to be framed for leasing out water bodies to fisherwomen, for viable and profitable ventures. Bivalve farming especially mussel culture faces a number of impediments like water salinity, seed availability, selection of location/site, climatic vagaries, identification of proper beneficiaries and proper monitoring opportunities. The major problems and constraints faced by the women in mussel cultivation are meat shucking problems, marketing of mussels, unpredictable seed availability, mortality of seeds during transportation, reduced growth during certain years, social constraints like caste splits, conflicts etc. to a certain extent.
- All the group members of the workshop were of unanimous opinion that the government agencies should come forward with improved marketing facilities as marketing of the mussel was perceived as one of the biggest constraints. Provision of loans with reduced interest rates and freezer facility for storage of harvested mussels can bring about a breakthrough in this sector in the near future.
- Occupational health hazards noticed in women engaged in fisheries because, long hours of monotonous work are causing specific health hazards to fisherwomen depending on the type of work. In a study at Anjilikkad area, it was observed that 33% of women engaged in clam fisheries are suffering with backache. As they are exposed to smoke, they are also suffering with headache (19%). Because of hard work 21% of women engaged were having myalgia. During their hard work, they are not caring about the diet. Hence it was observed that 17% of women engaged in clam fisheries are found to have anemia. On prolonged working, those who are going for clam picking suffer problems with sight and hearing [30].
- The modernization of fisheries over the last four decades has essentially reduced women's role in the fishing industry in many ways. The modernization has led to the concentration of

fish landings in the harbors, the displacement of women from fish vending and the trade was taken over by fishermen. Some women who have no option other than fish vending to sustain their families now face many hardships. The large seafood export processing industry has provided many opportunities for women's employment, but only women from certain pockets can make use of these avenues. Moreover this export -oriented production cum processing sector has effectively transformed women from an independent self-employed status to that of wage earners.

- Improved transportation and infrastructure have reduced the opportunities of women engaged in drying and curing activities. With the coming up of net making factories, women have now almost vanished from the scene of net making.
- Wage disparity and drudgery were often observed as notable issues in major sectors of employment in fisheries and mariculture sector which requires a considerable revamping.
- Poor living conditions and livelihood security, educational illiteracy, lack of proper employment, socially unorganized set up, gender inequality, alcoholism of men fisherfolk and exploitation, health problems, cultural bonding, customs, traditions, conservatism etc are the general constraints faced by the women fisherfolk. In the meantime, at the SHG level, the marketing aspect was the major issue and the difficulty in choosing an appropriate micro enterprise for sustenance often makes the SHG as an additional burden. As marketing aspect was perceived to be the major constraint of the SHGs rather than procedural hurdles of preparing minutes, reports, meetings, banking etc. it is obvious that it is high time for diversification of micro enterprise in addition to fishery based ones in these SHGs' for sustainability.
- Integrating gender perspective in aquaculture research and technology development is inevitable because the gender mainstreaming approach advances gender equality and equity in the society. Equity is a means and equality is a result. Though women's role in Indian fisheries sector is very significant, there is a gender bias in respect of their works and the inequalities between men and women in rural India are observed in the social, cultural and economic lives and are being maintained in the society through various forms of bias. The advantage of integrating the gender perspective in aquaculture research and technology development is that it allows for the advancement of gender equality and equity regardless of whether it is women or men who are disadvantaged or whose position needs to be addressed and thereby identifies the areas where progress is lagging and highlights the need for intervention in specific areas in policy making and planning in aquaculture research and technology development.
- There is a genuine need for integrating gender perspective in development works or in aquaculture extension also because women are the important stakeholders of our development process and our Extension system hardly targets the women folk for technological empowerment. Though women participation in fisheries sector though is age old, they are often engaged in traditional methods of processing and marketing. Their participation in aquaculture sector is not yet properly defined in the Indian context or requires a lot of advancements. Aquaculture is a developing sector and women participation in this sector needs meticulous planning for technological empowerment encompassing the social and technical barriers. The planners'

Variable	Quantified value (in per cent)
Credit orientation	47
Economic motivation	68
Scientific orientation	79
Risk orientation	67
Socio economic status	49
Social participation	78
Extension orientation	66
Mass media participation	73
Cosmo politeness	62

**Table 16:** Quantification of independent variables of women in Marol dry fish market.



perception of women and their roles has led to the introduction of aquaculture as a male activity. Consequently, extension services have ignored women's work in aquaculture. Past experiences have shown that more intensive fish culture systems are not within the reach of many small-scale farmers, especially women. Access to resources differs for men and women, and some of the biggest constraints women face are time and labor. A different kind of technical package may allow greater adoption by women farmers than is possible now. To ensure this, gender mainstreaming approach through integrating gender perspective in development works and aquaculture extension is a paramount requisite.

## Conclusions and Future Direction

No nation can ignore fifty per cent of its population and bring in social change and economic prosperity. To ensure rapid economic development, removal of gender imbalances should be established as a priority. This would mobilize the remaining fifty percent of the country's human resources and would result in the smooth movement of the economic wheel. National policies should be resolute in tackling this issue and local bodies should ensure the implementation of these policies at the community level [31]. There is immense need to create better opportunities for women in coastal fishing communities to enhance their social and economic role and enable them to participate in development efforts, rehabilitation and conservation of the coastal and aquatic environment. Location-specific and need based training programs for fisherwomen should be organized to enhance the awareness and technical know-how enabling them to start self-generating gainful employment ventures in aquaculture and post-harvest sector of fisheries.

The special features of fisheries and aquaculture make it necessary to link micro finance to appropriate technology development and transfer to women clients. Both capture fisheries and aquaculture requires upgraded vocational training programs and technical advice crucial for the success of women's micro enterprises. CMFRI has developed a technology for the farming of mussels in the open sea and protected bays. The technology is simple and cost effective and has been widely adopted by the fisher folk of Kerala and Karnataka [10]. Several women SHGs in the Kasaragod district of Northern Kerala have successfully tailored the venture and proved profitable. There is enormous scope to adopt and expand ornamental fish culture to earn surplus high income both in rural and urban centers. Women could significantly contribute to this sector if trained and oriented in the right direction. Opportunities for women in fisheries could be enlarged in the field of integrated aquaculture, agribusiness consortia fishery estates, marine products development management of fishery infrastructure marketing and export as well as in research and technology development.

Pearl culture could be suggested as an alternative and lucrative micro-venture, especially to women, both in the marine and freshwater segments. Although indigenously developed technologies for marine and freshwater pearl culture are available, few commercial ventures have come up [32]. Freshwater pearl culture is fast picking up and there are moves to integrate it with the carp culture to generate additional revenue to the farmer. Women could take up pearl culture as a productive income-earning venture on account of the vast unutilized potential. Promotion of diversified value added products not only accelerate earnings in exports, but also provide a multiplier effect on employment front especially for weaker sections and women folk. An additional export of almost 1-lakh tonnes of value added products in our marine products could easily corner about Rs.1500 crores of export

earnings and generate regular employment to about 35,000 fisherfolk. Efforts taken by government and non-governmental agencies to organize fisherwomen into self-help groups and to involve them in the preparation of value added products and marketing has brought out encouraging results.

Development of backyard hatcheries to cope with the local demand patterns of quality seeds of fish/shrimps could be taken up by women. House-based ventures are more preferred by women and found suitable to their present social fabric. Aqua-feed making using the indigenous resources, as a cottage industry may be developed to suit the needs of the aquaculture industry. Appropriate training programs, including the possible linkages of necessary credit facilities in liaison with scientific institutes and formal financial institutions respectively should be imparted to the primary stakeholders are needed. Quantifying ergonomics of the women involved in aquaculture and allied activities by generating data and documenting the gender literature are important. For determining the economic contribution of women fisher folk in order to enhance visibility, there is a need for the sensitization of development organizations and staff towards fisherwomen's economic and financial needs. Similarly improving the socioeconomic condition of women fisher folk in terms of the pertinent areas of maternal health and nutrition care are important.

Mobilization of Self Help Groups, setting up of Mahila Rural Co-operative banks, Women cell and collaboration and networking with NGOs etc are to be worked out by using the strategy developed in the case studies as a practical manual. Promoting "men and women partnership firms" instead of exclusively women-oriented enterprises is another practical strategy. It is seen that husband-wife enterprises with one or two helpers in fish processing/marketing in fishery related activities and other fishery related activity yields better prospects. Integration of the gender perspective in aquaculture research and technology development is an essential requisite because the gender mainstreaming approach advances gender equality and equity in the society. Similarly it is quite necessary for integrating gender perspective in aquaculture extension also because women are the important stakeholders of our aquaculture development process and our Extension system hardly targets the women folk for technological empowerment.

## Acknowledgements

Authors are grateful to Dr. Mohamed Shariff bin Mohamed Din and Dr. Zumilah Zainalaludin, the organizers of ASEM Aquaculture Platform WP7 international workshop in Malaysia, Dr. G. Syda Rao, the ex-Director, CMFRI, Dr.A.Gopalakrishnan, the present Director, CMFRI and Dr. R. Narayana kumar, the Head of the Socio Economic Evaluation and Technology Transfer Division (SEETTD), CMFRI for the wholehearted cooperation rendered to undertake the study.

## References

1. Kieffer CH (1983) Citizen empowerment: a developmental perspective. *Prev Hum Serv* 3: 9-36.
2. Rao GS (2011) Cage Culture-Mariculture Technology of the Millennium in India. In: Training manual on Cage culture of marine finfish and shellfish, Karwar Research Centre of CMFRI 1-12.
3. Sathiadhas R, Narayanakumar R, Aswathy N (2011) Efficiency of domestic marine fish marketing in India - a macro analysis. *Ind J Fisheries* 58: 125-131.
4. Modayil MJ, Sathiadhas R and Gopakumar G (2008) Marine Farming: Country Analysis - India. In: Lovatelli A, Phillips MJ, Arthur JR and Yamamoto K (eds.) FAO/NACA Regional Workshop on the Future of Mariculture: a Regional Approach for Responsible Development in the Asia-Pacific Region, Guangzhou, China, 7-11 March 2006. FAO Fisheries Proceedings, No 11, Rome, FAO 145-171.



5. Radhakrishnan EV, Dineshbabu AP (2011) Cage Culture - Mariculture Technology of the Millennium in India. In Training manual on cage culture of marine finfish and shellfish, Karwar Research Centre of CMFRI 13-22.
6. Mohamed KS, Kripa V (2010) Framework for mariculture water lease policy in India. RALBAM 55-64.
7. Sahoo PK, Vipinkumar VP, Mishra AK, Srinath M (2009) Gender Participation and Gender Issues in Mussel Culture - A Study from Coastal Village of Kerala. In Compilation of Abstracts of National Seminar on Women in Agriculture organized by International Extension Forum (IEF), Directorate of Research on Women in Agriculture (DRWA) and Research Association for Gender in Agriculture (RAGA), Bhubaneswar 25.
8. Kripa V and Mohamed KS (2008) Green Mussel, *Perna viridis*, Farming in Kerala, India-Technology Diffusion Process and Socioeconomic Impacts, Journal of the World Aquaculture Society 39: 612-624.
9. Vipinkumar VP, Appukuttan KK, Asokan PK (2001) Mussel Farming by Women's Self Help Groups in Kasargod District - A Case Study. Mar Fish Inf Serv T&E Ser. 169: 4-6.
10. Pillai VN (2000) Bivalve mariculture in India (pearl oyster, edible oyster, mussel and rock oyster)-A success story in coastal ecosystem development. Asia-Pacific Association of Agricultural Research Institutions. FAO Regional Office for Asia and the Pacific, Bangkok 1-56.
11. Vipinkumar VP, Asokan PK (2008) Mussel Farming Technology Dissemination to the Self Help Groups Ind J Extn Educ 44: 112-115.
12. Lewin K, Lippett R and White R (1960) Leader Behavior and Member Reaction in three social climates. In Group Dynamics: Research and Theory. (2nd edn), Cartwright D, Zander A (eds.) Evanston, Ill: Row, Paterson & Company.
13. Pfeiffer JW, Jones EJ (1972) Annual Handbook for Group Facilitators. Pfeiffer & Company, San Diego, California 3: 19-24.
14. Hersey P, Blanchard KH (1995) Management of organizational Behaviour (6th edn) Prentice Hall, New Delhi 345-365.
15. Vipinkumar VP, Singh Baldeo (1998) Dimensions of Self Help Group Dynamics of Horticulture Farmers. J Extn Educ TNAU, Coimbatore 3: 1-9.
16. Vipinkumar VP, Shyam SS, Narayanakumar R, Sathiadhas R, Madan S, et al. (2013) Coastal Rural Indebtedness and Impact of Microfinance in Marine Fisheries Sector. Central Marine Fisheries Research Institute 2, Kochi 165.
17. Yaron J (1992) Rural Finance in Developing Countries. World Bank, Washington.
18. Yunus M (1999) "Banker to the Poor: Micro Lending and Battle against World Poverty". Pacific Affairs. New York 121.
19. Kurien John (2000) The Kerala Model - It's Central Tendency and the outlier' In 'Kerala - the Development Experience: Reflections on Sustainability and Replicability' Govindan Parayil (eds.) London: Zed Books 476.
20. MCITRA (2003) A study on Empowerment of Women Fish workers in the Traditional Marine Fishing Community of Malabar: Problems & Areas of Intervention. Malabar Coastal Institute for Training, Research and Action Calicut 9-54.
21. Fernandez AP (1995) Self Help Groups - the Concept. Mysore Rehabilitation Development Agency 1-5.
22. Vedachalam E (1998) Community Action for Rural Development (CARD) Micro-Enterprise is the Need of the Hour. In Micro-Enterprise Development - Potentials and Possibilities. Asian Society for Entrepreneurship Education and Development (ASEED) New Delhi 172-176.
23. Vipinkumar VP (2005) Livelihood Analysis of Coastal Fisher folk for Technological Empowerment - An Appraisal in Kerala. In: Compendium of abstracts of National Seminar on Green to Evergreen: Challenges to Extension Education, Indian Society of Extension Education 93.
24. Vipinkumar VP, Asokan PK (2011) Case Studies on Dynamics of Self Help Groups in Mussel Culture. In Lecture Notes of Green Mussel Farming, Calicut Research Centre of CMFRI, NFDB Sponsored Training Programme 27-39.
25. Aujimangkul S, Namasonthi A, Jindanon A and Wongsanga P (2000) Participation of fishermen in the seasonal closure: Measures for marine fishery resources conservation: A case study in the western part of the Gulf of Thailand. Kasetsart University Fishery Research Bulletin No 23: 1-20
26. DFID (2001) Sustainable Livelihoods Guidance Sheets. DFID, London.
27. Graham, Jennifer and Gaynor Tanyang (2001) The Sustenance of Life: A Pilot Research Exploring SL in CBCRM, Tambuyog Development Centre and Coastal Resources Research Network, Dalhousie University.
28. CBCRM Resource Centre (2003) Sustainable Livelihoods Issues in CBCRM. In Sustainable Livelihoods in Community Based Coastal Resource management San Antonio, Zambales, Philippines 2: 32-34
29. Arciaga, Orlando, Fernando Gervacio, Robert Charles Capistraco and Cathrine Demesa (2002) Envisioning Life: Community-created Sustainable Livelihood Analysis and Development. Philippines: Hribon Foundation & International Development Research Centre 62.
30. Sathiadhas R, Femeena H (2005) Empowerment of Women involved in Clam Fisheries of Kerala - A Case study. Int J Soc Res 46: 39-48.
31. Shyam SS, Antony B, Geetha R and Ganeshkumar B (2011) Women Empowerment and Fisheries Sector in Kerala, CMFRI, Kochi, 140-145.
32. Narasimham KA (2001) Pearl culture potential, In Proceedings on the Awareness workshop (Coastal) on Biotechnology based programmes for women and rural development, Kakkinnada 32-33.