

Glimpses of gender mainstreaming in Indian marine fisheries sector

Vipinkumar VP¹, Meenakumari B², Shanthi B³, Jayasankar P⁴

1. Senior Scientist, Central Marine Fisheries Research Institute (CMFRI), Kochi, India
2. Deputy Director General, Fisheries, Indian Council of Agricultural Research (ICAR), New Delhi, India
3. Principal Scientist, Central Institute of Brackish Water Aquaculture (CIBA), Chennai, India
4. Director, Central Institute of Fresh water Aquaculture (CIFA), Odisha, India

Received 09 May; accepted 29 July; published online 01 August; printed 16 August 2013

ABSTRACT

The paper highlights the glimpses on gender mainstreaming in Indian marine fisheries sector focusing attention on the gender equity and equality emphasized in the Indian context. Gender empowerment paradigm has been explored along with emphasizing the three pillars such as economic empowerment, well-being and decision making. Policy and programs for aquaculture development in India also have been given a vivid explanation followed by mariculture sector. 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. Although about 1.2 million ha is suitable for land based saline aquaculture in India, currently only 13 % is utilized. Important legislations in the Mariculture farming systems prevalent in India have been explored step by step with data on involvement of men and women in Marine Fisheries and Mariculture. All the mariculture technologies conspicuously being disseminated by Central Marine Fisheries Research Institute with involvement of women and those possessing potential for women's participation such as 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 have been explained. The paper also highlights the gender issues and challenges in mariculture and marine fisheries sector in India and the future direction to proceed further. 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. 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. 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.

Key words: Gender mainstreaming, Gender perspective, Equity, Equality, Mariculture, Marine Fisheries

Abbreviation: SHG: Self Help Group, WID: Women in Development, GAD: Gender and Development

1. INTRODUCTION

It is an unequivocal proposition that the policy and program on women and gender in India do have a vital significance in the present context. 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 favour 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 73rd and 74th 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.

Sex and Gender:

Sex is the biological difference between women and men, whereas gender is the socially constructed differences between women and men.



Content

This study was undertaken as a part of the assignment by the UPM (Universiti Putra Malaysia) the ASEM Aquaculture Platform WP7, workshop on 'Empowering Vulnerable Stakeholder Groups' organised in Kuala Terengganu of Malaysia during the period from 6th to 10th February, 2012 which focussed on gender and aquaculture and the policy makers and extension scientists who represented India in the workshop were the authors of the paper namely Dr.Vipinkumar,V.P, Senior Scientist, CMFRI, Kochi, Kerala, Dr.B.Meenakumari, Deputy Director General, (Fisheries), ICAR, New Delhi, Dr.B.Shanthi, Senior Scientist, CIBA, Chennai, Tamil Nadu and Dr.P.Jayasankar, Director, CIFA, Bhubaneswar, Orissa.

The goal of the National Policy 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.

Globalization has presented new challenges for the realization of the goal of women's equality, the gender impact of which has not been systematically evaluated fully. 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.

The dimension of Social Empowerment 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.

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.

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 operationalisation of the Policy on a regular basis. National and State Resource Centres 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 programme framers, implementation and development agencies, law enforcement machinery and the judiciary, as well as non-governmental organizations are being undertaken. The 73rd and 74th 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.

Speaking the women empowerment paradigm, according to Kieffer (1984), 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

Self Help Group:

The group in which members are linked together by a common bond like caste, sub-caste, blood, community, place of origin or activity which provides the benefits of economies in certain areas of production process by undertaking common action programmes like cost effective credit delivery system, generating a forum for collective learning with rural people, promoting democratic culture, fostering an entrepreneurial culture, providing a firm base for dialogue and co-operation in programmes with other institutions, possessing credibility and power to ensure participation and helping to assess the individual member's management capacity.

Women Empowerment:

Empowerment basically refers to the process of raising women status by way of promoting economic, social, political and local empowerment. It 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.



Photograph 1

Participants from India: Dr.B.Shanthi, Dr.B.Meenakumari, Dr.P.Jayasankar and Dr.V.P.Vipinkumar

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.

Gender mainstreaming:

A strategy articulated with gender and development goals and a commitment to gender equality in all aspects of policy and programme design and implementation which aims to transform the mainstream at all levels to end gender discrimination.

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.

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

1. 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.
2. 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.
3. 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.

With these perspectives, under the UPM (Universiti Putra Malaysia) the ASEM Aquaculture Platform WP7, workshop on 'Empowering Vulnerable Stakeholder Groups' was organised in Felra Residence of Kuala Terengganu of Malaysia during the period from 6th to 10th February, 2012. As the workshop focussed attention on gender and aquaculture looking into consideration in equity and equality, the men and women participants were equal in number i.e 14 each with the funding under the University Putra Malaysia. The team of policy makers and extension scientists participated in the workshop from India consisted of the authors of the present paper such as Dr.B.Meenakumari, Deputy Director General, (Fisheries), ICAR, New Delhi, Dr.P.Jayasankar, Director, CIFA, Bhubaneswar, Orissa, Dr.B.Shanthi, Senior Scientist, CIBA, Chennai, Tamil Nadu and Dr.Vipinkumar,V.P., Senior Scientist, CMFRI, Kochi, Kerala (**Photograph 1**) The major topics covered were basic understanding of gender, poverty eradication policy and programme, gender issues in development, gender issues and barriers in aquaculture, gender analysis tools : livelihood analysis, development context, stakeholder analysis, empowering vulnerable stakeholders, gender mainstreaming and budgeting, gender disaggregated data, scaling up, best practices in aquaculture food production, logical framework analysis and action plan preparation and presentation including an explorative field visit to entrepreneur ventures of women and Fisheries University at Kuala Terengganu.

2. SCOPE OF THE STUDY

As the present study dealt with a diagnostic assessment on the glimpses of gender mainstreaming in Indian marine fisheries sector, in a descriptive way, focusing attention on the gender equity and equality emphasized in the Indian context, there is ample scope to explore the gender empowerment paradigm along with emphasis on the three pillars such as economic empowerment, well- being and decision making. Policy and programs for aquaculture development in India also have been given a vivid explanation followed by mariculture sector. Among the Asian countries India ranks third in capture fisheries and second in aquaculture. Looking into the policy and programs for aquaculture development in India, it could be observed that the production from marine sector has almost attended the plateau where as 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, 29000km 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



WID/GAD:
Women in Development (WID) and Gender and Development (GAD) refer to two essentially different approaches to development. WID is based on the assumption that women are 'left out' of development, and need special projects to integrate them. GAD is based on gender analysis and sees gender equality as a fundamental development goal, with women's empowerment and agency as key features of development strategy.

resource provides lifeline to more than 14 million people. About 3651 coastal villages' economy depends on fisheries activities. The Indian 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 labour 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 km² 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 (Rao Syda, 2011). The Indian fish production is contributed by marine and inland sectors.

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 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.

Like any other sector 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 & 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 and thereby an in depth observation on these dimensions made through the present study has ample scope to explore the paradigm of gender balance and women empowerment based on views of Women in Development (WID) and Gender and Development (GAD).

2.1. Methodology

As this is basically a diagnostic study on the issues on gender mainstreaming in marine fisheries sector, the data gathering protocols on gender mainstreaming were standardized with major variables and dimensions to be quantified for the data collection with expert consultation and local enumerators trained for data collection in the potential pockets where mariculture technologies were disseminated were used to gather primary data. Since the study focused on descriptive research on the gender empowerment paradigm in mariculture, secondary data collection also contributed a vital role. Data were collected on socio economic and behavioural aspects from fisherfolk respondents among the different types of identified stakeholders under primary, secondary and tertiary sectors throughout the country in the study locations of the mariculture technology. The information was essentially gathered through secondary data collection and triangulation done in consultation with major sources of information such as the fishermen co-operative societies, Self Help Groups of fisherfolk, through the survey staff of the Fishery Resource Assessment Division of CMFRI and marine fisheries census reports of CMFRI. Data were also gathered on demographic characteristics and elucidated specific case studies of women in mariculture sector. A true introspection of the livelihood of women fisherfolk mobilized in the selected mariculture locations was also undertaken in the present study.

3. RESULTS

The major results of the explorative research are presented under the paradigms of policy framework of mariculture, central legal frameworks, involvement of men and women in marine fisheries and mariculture, brief account of mariculture technologies of the country and the discussion on gender issues and challenges in mariculture and marine fisheries sector in India.

3.1. Policy framework of Mariculture 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 is more than 70 % of the harvestable potential (Sathiadhas et al, 2011). 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, seaweeds 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 5th top most shrimp producer from culture. Farmed shrimp contributes about 60% by volume and 82% by value of India's total shrimp export.

Table 1
Mariculture farming systems prevalent in India

No	Resource	Location	Type of farming	Farming status	Status regarding lease
1	Shrimps	Intertidal/subtidal	Land based (ponds)	Commercial	Lease policies exist in some maritime states guided by rules framed by AAI
2	Oysters	Intertidal/subtidal Open waters	Off-bottom (Rack & ren)	Commercial (in Kerala)	None
3	Mussels	Intertidal/subtidal Open waters	On bottom, Off-bottom (Racks, lines, rafts)	Commercial (in Kerala)	None
4	Pearl Oyster	Bay/lagoons/ Oceanic open waters	Off-bottom (Rafts & cages)	Experimental (Commercialization Transition Phase)	None
5	Clams	Intertidal/subtidal Open waters	On bottom	Semi commercial (in Kerala, Karnataka)	None
6	Crabs	Intertidal/subtidal	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

Share of cultured shrimp export is 78, 700 t valued at INR. 3,3000 million. The area under shrimp farming is about 1,35,000 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 finfishes 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 marine 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 (Modayil et al, 2008). 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 (like Self Help Groups and Microfinance) that individuals and households use to earn a living (Yunus, 1999, Aujimangkul et al, 2000, DFID, 2001; Graham and Tanyang, 2001; Arciaga et al, 2002; CBCRM Resource Center, 2003; Ashby, 2003, Vipinkumar, 2005, Vipinkumar and Asokan, 2008 & 2011, Vipinkumar et al, 2013).

In spite of the fast paced developments a policy support to govern the mariculture development in a sustainable manner has not been made in the country. 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 73rd and 74th amendments to the Constitution of India empower the panchayats to perform functions mentioned in the 11th 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 an 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 (Radhakrishnan and Dineshbabu, 2011).

3.2. 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
- 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 (Mohamed and Kripa, 2010).

1. Common Property use conflicts: Policy guided by : Use of open water bodies for navigation and fishing should



Table 2

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

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& 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 3

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

State	Marketing	Net making/repair	Curing/Processing	Peeling	Labourer	Others	Total	Total male & 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
Pondicherry	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& 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

activities should take into consideration conservation of aquatic biodiversity.

5. 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.

3.3. 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:

3.3.1. 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 (Photograph 2). A harvestable size of 70-80 mm is reached in 5-7 months and production of 12-14 kg mussel (shell on) per metre 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 Self Help Groups (SHGs) with active support from local administration and developmental agencies like Brackish water Fish Farmers Development Agency (BFFDA) and State Fisheries Department. In a recent research study, 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 (Sahoo et al, 2009).

3.3.2. Edible Oyster Farming



Photograph 2

Open sea mussel culture at Karwar in Karnataka

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.

2. Carrying capacity: Open water bodies have limits to biological productions and such limits should be defined by the state in consultation with research institutions.
3. Environmental Protection: The polluter pays principle enacted by the CAAI should be applicable to pen water bodies so as to minimise environmental impacts. Pre and Post EIA (Environmental Impact Assessment) is mandatory.
4. Conservation: Aquatic ecosystems are very sensitive to changes caused by human activities and hence all

Table 4
Number of Farmers and Production of Oyster and Mussel in India (Source: Molluscan Fisheries Division, CMFRI, 2011)

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



Photograph 3
Edible oyster culture by women's Self Help Group in Kasargod of Kerala

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 (Photograph 3). 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 4 (Kripa, and Mohamed, 2008). Of these around 75 % of the farmers are women mobilized as Self Help Groups.

3.3.3. 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 colour, 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 centres 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 programme 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 neighbouring Asian countries, and various Memorandums of Understanding (MoU) have been signed with entrepreneurs, desirous of pearl culture since 1996. Success has been obtained in the production of Mabe 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. Mabe pearl production was standardized for production of base images with ten different types of moulds. Technology for production of jewelry from Mabe pearl was also standardized.

3.3.4. 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 15-25tonnes/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*.

3.3.5. 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 *Panulurus 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 m². Recently major breakthrough in breeding and hatchery production of two species of scyllarid lobsters, *Thenus orientalis* and *Scylla rusugosus* 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.

3.3.6. 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 size 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 in star 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 programmes along the east coast.

3.3.7. 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 programmes. 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 soybean 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.

3.3.8. Marine Finfish Culture

In the area of marine fish culture, the country has advanced a lot. Attempts have been made to develop suitable hatchery and farming technology for mullets (*Mugil cephalus*, *Liza macrolepis*, *V. seheli*), groupers (*Epinephelus tauvina*), sea bass (*Lates calcarifer*), milkfish (*Chanos chanos*) and pearlspot (*Eetroplus suratensis*). CMFRI recently achieved breakthrough success in broodstock development, induced breeding and larval production of cobia (*Rachycentron canadum*) and culture of pompano (*Trachynotus blochii*). The Central Institute of Brackishwater Aquaculture (CIBA) has developed an indigenous hatchery technology for sea bass using captive broodstock 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 84percent in the nursery phase have been recorded. Hormonal induction of Broodstock development was achieved in groupers.

3.3.9. 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.

3.3.10. Seaweed Culture

Around 60 species of commercially important seaweeds with a standing crop of 1,00,000 tons occur along the Indian coast from which, nearly 880 tonnes dryagarophytes 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 carrageenan yielding sea weed *Kappaphycus alvarezii* has become very popular and is being cultivated extensively 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 *Gelidium cerosa* 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 near shore 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.

3.3.11. 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 labour, the size of the HDPE cages has been modified to 6 m in the 4th 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 were are also being used in silent bays of east coasts (Photograph 4).

3.4. Gender issues and challenges in mariculture and marine fisheries sector in India: Discussion

- 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



Photograph 4
Open sea cage farming

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 are 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 (Sathiadhas and Femeena Hassan, 2005).
- The modernisation of fisheries over the last four decades has essentially reduced women's role in the fishing industry in many ways. The modernisation has led to the concentration of fish landings in the harbours, 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 & livelihood security, educational illiteracy, lack of proper employment, socially unorganized set up, gender inequality, alcoholism of men fisherfolk & 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' 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 labour. 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.



4. CONCLUSION

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 (Shyam et al, 2011). 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 programmes 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 programmes 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 fisherfolk of Kerala and Karnataka (Pillai, 2000). 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 centres. 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 (Narasimham, 2001). 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 organise fisherwomen into self-help groups and involving 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 programmes, 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 fisherfolk 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 fisherfolk 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.

SUMMARY OF RESEARCH

1. A brief diagnostic study was undertaken on gender mainstreaming in Indian marine fisheries sector emphasizing on the gender equity and equality stressed in the Indian context. Policy and programs for aquaculture development in India also have been explored with special reference to mariculture sector based on primary and secondary data gathering methods. The major legislations in the mariculture farming systems prevalent in India have been explored step by step with data on involvement of men and women in Marine Fisheries and Mariculture. All the mariculture technologies conspicuously being disseminated by Central Marine Fisheries Research Institute with involvement of women and those possessing potential for women's participation such as 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. have been narrated.
2. The paper also highlights the glimpses of gender issues and challenges in mariculture and marine fisheries sector in India and the future direction to proceed further. For ensuring a rapid economic development, removal of gender imbalances should be established as a priority and this would mobilize the remaining fifty percent of the country's human resources and would result in the smooth movement of the economic wheel. Integrating gender perspective in aquaculture research and technology development is inevitable because the gender mainstreaming approach advances gender equality and equity in the society. The case studies explored the extent of empowerment brought out in different dimensions including social, political, spiritual and economic strength through Self Help Group mobilization and the suitability of appropriate micro enterprises for the betterment of livelihood parameters in the marine fisheries sector of the country.

FUTURE ISSUES

The future researchers can think about bringing social action for sensitization on crucial issues like women fisherfolk's rights and marketing channels including policies and other interventions to ensure equality through gender mainstreaming in mariculture and marine fisheries sector. To get a distinct outlook of the scenario of gender mainstreaming and Self Help Group Dynamics of women, and exhaustive research with larger sample and wider area involving the farmers of other crop enterprises like cash crops, perennials and homestead farming systems would be of ample scope. Similarly it is quite necessary for integrating gender perspective in aquaculture/ mariculture 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.

ACKNOWLEDGEMENT

Authors are grateful to Dr.G.Syda Rao, the Director, CMFRI and Dr.R.Narayanakumar, the Head of the Socio Economic Evaluation & Technology Transfer Division (SEETD), CMFRI for the wholehearted cooperation rendered to undertake the study.

REFERENCES

- 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 p
- Ashby Jacqui. 2003. Introduction: Uniting Science and Participation in the process of Innovation- Research for Development. In *Managing Natural Resources for Sustainable Livelihoods- Uniting Science and Participation*, IDRC, Ottawa, 252 p
- Aujimangkul S, Namasonthi A., Jindanon A and Wongsanga P. 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* 2000, 23, 1-20
- CBCRM Resource Centre. Sustainable Livelihoods Issues in CBCRM.pp 32-34.In *Sustainable Livelihoods in Community Based Coastal Resource management* 2003, Vol 2, San Antonio, Zambales, Philippines
- DFID. *Sustainable Livelihoods Guidance Sheets*.DFID, London, 2001
- Graham, Jennifer, Gaynor Tanyang. *The Sustenance of Life: A Pilot Research Exploring SL in CBCRM*, Tambuyog Development Centre and Coastal Resources Research Network, Dalhousie University, 2001
- Kripa V, Mohamed KS. Green Mussel, *Perna viridis*, Farming in Kerala, India – Technology Diffusion Process and Socioeconomic Impacts, *Journal of the World Aquaculture Society*, 2008, 39(5), 612-624
- Kieffer C. Citizen empowerment: a development perspective, *Prevention in Human Services* 1984, 3, 936
- Modayil MJ, Sathiadhas R, Gopakumar G. Marine Farming: Country Analysis- India, In A.Lovatelli, M.J.Phillips, J.R Arthur and K.Yamamoto (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, 2008, 145-171
- Mohamed KS, Kripa V. *Framework for mariculture water lease policy in India*. RALBAM 2010, 55-64
- Narasimham KA. Pearl culture potential, In *Proceedings on the Awareness workshop (Coastal) on Biotechnology based programmes for women and rural development*,Kakkinada. 2001, 32-33
- Pillai VN. *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, 2000 1-56
- Radhakrishnan EV, Dineshbabu AP. 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, 2011, 13-22
- Rao G Syda. 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, 2011, 1-12
- Sathiadhas R, Femeena Hassan. Empowerment of Women involved in Clam Fisheries of Kerala- A Case study. *Int. J. Soc. Res.*, 2005, 46(1), 39-48
- Sahoo PK, Vipinkumar VP, Mishra AK, Srinath M. *Gender Participation and Gender Issues in Mussel Culture- A Study from Coastal Village of Kerala*. (Abstract) 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, 2009, 25
- Sathiadhas R, Narayanakumar R, Aswathy N. Efficiency of domestic marine fish marketing in India - a macro analysis.*Ind. J. Fisheries*, 2011, 58(4), 125-131
- Shyam S Salim, Antony Bindu, Geetha R, Ganeshkumar B. *Women Empowerment and Fisheries Sector in Kerala*, CMFRI, Kochi. 2011, 140-145
- Vipinkumar VP. *Livelihood Analysis of Coastal Fisherfolk for Technological Empowerment – An Appraisal in Kerala*.(Abstract) In Compendium of abstracts of National Seminar on Green to Evergreen: Challenges to Extension Education, Indian Society of Extension Education. 2005, 93
- Vipinkumar VP, Asokan PK. Mussel Farming Technology Dissemination to the Self Help Groups. *Ind. J. Extn. Educ.* 2008, 44(1&2), 112-115
- Vipinkumar VP, Asokan PK. 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. 2011, 27-39
- Vipinkumar VP, Shyam S Salim, Narayanakumar R, Sathiadhas R, Madan S, Ramachandran C, Swathilekshmi PS, Johnson B, Aswathy N. *Coastal Rural Indebtedness and Impact of Microfinance in Marine Fisheries Sector*, Central Marine Fisheries Research Institute, e book No:2, Kochi, 2013,165
- Yunus Muhammed. Banker to the Poor: Micro Lending and Battle Against World Poverty, *Pacific Affairs*, New York. 1999, 121