

“A Sea of One’s Own!” A Perspective on Gendered Political Ecology in Indian Mariculture

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Abstract

In India, mariculture is a sunrise enterprise. Technologies that have attracted the imagination of coastal stakeholders include mussel farming, seaweed farming and open sea cage culture. Mussel (*Perna viridis*) farming technology has diffused along the Malabar coast (southwest India), and seaweed (*Kappaphycus alvarezii*) farming prevails along the Coromandel coast (southeast India), after it found a niche in the Gulf of Mannar. Having proven their potential as empowerment platforms for coastal women, the theatres where these technologies were adopted raised a number of issues in the realm of a gendered political ecology. The aim of this paper is not only to diagnose these issues but juxtapose them with some of the epistemological concerns being brought by “gender lens” scholarship, especially in the neo-liberal context of global fisheries. A paradox brought out by the present study is the ambivalence of the State in manifesting itself as a positive “bargaining” force in the intra-household domestic space (by providing State-sponsored platforms through the Self Help Groups) while leaving the “common access resource” space, from which these platforms gain sustenance, less amenable to its democratic ideals.

Introduction

Recently political ecologists have started using the gender lens while traversing areas other than agrarian issues. Bavington et al. (2004) argued that political ecology - defined as an interdisciplinary field of study that was originally devoted to combining the concerns of ecology and political economy and focused on the ‘constantly shifting dialectic between society and land based resources - has expanded to include marine ecosystems. In addition, it has opened itself up to themes like non-hierarchical, multifaceted, context-specific and often ambiguous relations between biophysical, knowledge production and socioeconomic processes, especially those involving domestic politics, class, gender, race and ethnicity.

The role played by gender as a social construct in shaping the contours of any discourse centred on the political ecology of sustainable development is increasingly recognized thanks to relentless efforts of gender scholars spanning a multitude of academic disciplines as well as theatres of transformative grassroots level action. Women are increasingly “redefining their identities and the meaning of gender through expressions of human agency and collective action emphasizing

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struggle, resistance and cooperation” (Rocheleau et al. 1996) in turn redefining environmental issues to include feminist epistemologies. Though these discourses have helped us to create a more just society, which is the fundamental aim of gender studies, entrenched notions of male dominance still prevail in the case of the marine fisheries, probably due to a paucity of gender sensitive research (Williams, 2010).

Gender lens and political ecology of mariculture - a theoretical perspective

I have chosen the title of this paper to resonate with that of a path-breaking study by Bina Agarwal (1996) which raised the discourse on gender to a new level, offered a new perspective on the dialectic between conflict and cooperation in the household, and gave a persuasive analysis of the relationship between gender consciousness and political resistance. Though the analysis attempted in the present paper owes much to the insights gleaned from that study, the point of departure is on the “materiality of nature” (the biophysical realities of natural systems and the way these have influenced ecosystem dependence) in the fluid context of the marine ecosystem.

Mariculture, the science dealing with the study of cultivation of beneficial organisms in a marine environment, marks a significant paradigm shift in the way we look at controlled marine production systems. The production from coastal ecosystems through farming, which was less than 0.5 million tonnes in 1950, increased to 10 million tonnes in 1990 and to 36 million tonnes by 2007 (FAO, 2009). Currently 106 nations are involved in farming marine organisms. Just as agriculture makes the terrestrial production system a contested space, mariculture makes the marine production system also a contested space. The struggle for human livelihood, having ecological as well as political dimensions, is affected by a nested system of complex factors that emerge in the neoliberal context of market integration and globalization, the consequences of which are unlikely to be unidirectional.

Bringing gender relations into this arena is poised with many challenges. Gender relations are conceptualized as relations of power between women and men (as revealed in a range of practices, ideas, and representations including the division of labour, roles and resources between women and men, and their attribution to different abilities, attitudes, desires, personality traits, behavioural patterns etc.) and largely seen as a social construct varying over time and space (Agarwal, 1996). Since “it is not just an increase in women’s command over economic resources but also the “process” by which that increase occurs that has a critical bearing on gender relations” (Agarwal, 1996), these challenges are not confined just to the lack of gender disaggregated data but also to epistemological ambiguities. For example, the levels of analysis usually considered by gender scholars such as household, community, market and State are inadequate if we want to provide a political ecology perspective. Moreover, some scholars argue that these institutions (e.g., community) should be viewed as dynamic processes rather than as conventional bounded units in space (Kuhl and Sheridan, 2009).

Property rights are one major form in which relations between natural resource users and the ecosystem manifest. These can be categorized as private, State owned, open access and common (Ostrom, 2000). The marine space is generally conceived as a common property system with higher institutional complexity than other ecosystems. In marine common property fisheries, the role played by women has attained better visibility and recognition (both in academic and political terms). However, few efforts have been made yet to understand the gendered way in which the various dimensions of tenurial relations like control, access, use and responsibilities get put into practice and achieve legitimacy. Many reasons could be proposed for this gap. The whole debate on marine Common Property Rights (CPR) issues arose following the 1982 United Nations Convention on the Law of the Sea and initially centred around harvest rights like ITQs but, later, on spatial issues. In the case of marine customary rights, gendered aspects remain silent either because the marine domain is historically considered as an exclusive male domain or due to the stigmatized nature of certain coastal property, e.g., the mangrove clam gathering areas used by women in Ecuador (Kuhl and Sheridan, 2009). Unlike the agrarian scenario, the vexed issue of women getting excluded and dispossessed in the marine property rights regime is yet to emerge either as a serious intellectual debate or activist-led struggles. But absence of resistance (overt and covert) doesn't mean absence of inequality (Sen, 1990). As mariculture is a sunrise enterprise in the coastal ecosystem, demand exists for the intervention of maritime States to thrash out appropriate leasing policies. The present analysis is being attempted in this context.

Methodology

The present analysis draws on the author's insights derived from conducting studies on gender issues in Indian marine ecosystems for the last four years. The current study is a follow up of an earlier study (Ramachandran et al. 2007) which analysed gendered spaces in the technology-sustainability interface in two fisheries contexts, mussel farming and tuna fishing. Along with mussel farming, two more technologies, open sea cage culture and seaweed farming, were subjected to similar analysis from 2008 to 2010. Field studies were done in several locations where these technologies were diffusing: Padanna and Kollam in the State of Kerala for mussel farming; Visakhapatnam (Andhra Pradesh), Karwar (Karnataka) and Balasure (Orissa) for open sea cage farming; and Ramanathapuram district (Tamil Nadu) for seaweed farming. The study was conducted using a combination of household socioeconomic surveys done along the two coasts and case studies of different stakeholders along the value chain of mussel as well as seaweed farming. A number of secondary sources also were consulted before arriving at conclusions.

Results and Discussion

a) Mariculture in India – a comparative overview

In recent times, mussel, seaweed and open sea cage farming are mariculture technologies that attracted the imagination of Indian coastal stakeholders. While mussel (*Perna viridis*) farming technology has diffused along the Malabar coast, seaweed (*Kappaphycus alveressii*) farming prevails along the Coromandel coast after finding a niche in the Gulf of Mannar. Open sea cage culture is the latest entrant; it was only successfully demonstrated in 2007. Since the technical details of these technologies are detailed elsewhere (Kripa and Surendranath, 2008; Laxmilatha, 2009; Rao, 2009), what is attempted here is a comparative overview. However, to amplify the comparison in Table 1, a brief description of the socioeconomic context of each technology is given below.

Mussel farming

Mussel farming in Kerala has a remarkable trajectory. In the late 1970s, the Central Marine Fisheries Research Institute (CMFRI) originally developed the technology for open sea mariculture but it took anchor in estuarine systems in 1995-96 and finally became popular as a women's empowerment tool in coastal Kerala from 2000 onwards. Padanna, an estuarine village on the north Malabar coast, where the first demonstration was successfully conducted, acted as the epicentre of mussel farming in India. The major driver for diffusing the technology was a Muslim male entrepreneur in the village who took the initiative to organise commercial production through women's Self Help Groups (SHGs) in the village (Ramachandran et al. 2007). Until the emergence of mussel farming, the major alternative vocation for these women was collection of clams from the estuary. Now, clam collection is very rarely practiced.

In 2010, the total production of farmed mussels from five districts of Kerala State reached 20,000 tonnes, compared to nil before 1995. Occupying a mere 0.002% of the potential area for adoption the technology has yielded an estimated US\$8.64 million as net direct and indirect benefits (Ramachandran et al. 2007). Apart from the economic aspects, the most important feature of the technological change is that mussel farming is dominated, all over Kerala, by female-led SHGs. It has gained popularity and more than 3,000 women have become owners of mussel farms (Kripa and Surendranathan, 2008).

Apart from profitability, what made the technology more women friendly was the fact that, once the racks are made and placed in the water, a job mostly done by men who can be hired at a cost of about \$5.5day⁻¹, the rest of the activities could easily be done by women. These activities included seeding in specially stitched cloth bags tied on ropes, monitoring of growth, harvesting, cleaning (depuration), and shucking. Mussel farming is almost “do-nothing farming” with a short growth period of 4-5months. The seeds and other inputs are brought by male agents who also act as

procurers of the produce. But another important factor was the subsidy support (about \$100 per woman farmer in 1996-97 and US\$300 per women's SHG in 2004) provided by the State through the *Kudumbasree Programme*. This fact was not mentioned by Kripa (2008) and Laxmilatha et al. (2009). During 2007-8 under the Tsunami Assistance project, the Agency for Development of Aquaculture Kerala (ADAK), which is an autonomous body under the Government of Kerala, released an amount of US\$24,000 as subsidy to about 100 woman SHGs. Although State financial support and the licenses issued by the Panchayats (ie, village level local government bodies) were restricted to women SHGs initially, since 2008 these benefits have been extended to men's SHGs, having seen how lucrative the ventures were. This is a very significant change in terms of gender ideology.

Seaweed farming

In coastal India, seaweed farming underwent a transition from an activity based on organized "collection" from the sea by women (*Gelidiella spp*, *Gracilaria spp*, *Sargassum spp* and *Turbinaria spp*), which was started commercially in the late 1960s by fisherwomen in the Gulf of Mannar region, to that of "culture" (again mainly by women) which began in about 2000. Seaweed mariculture in India received a decisive impetus with the entry of red seaweeds like *Kappaphycus alverizii*, the cultivation techniques of which were standardized by a public funded research organization (Central Salt and Marine Chemicals Research Institute (CSMCRI)) and popularized by a transnational company (Pepsico). Production of *Kappaphycus* increased from 21 tonnes (dry form) in 2001 to more than 700 tonnes in 2009.

A seaweed farmer typically earns US\$65-120mth⁻¹. About 1,000 people, mainly women, are currently engaged in Kappa farming using the bamboo raft method which was standardized in 2003 after the mono-line method was found to be unviable due to severe grazing. Until 2008, the cultivation is organized mainly as a contract farming system under Pepsico, after which it was continued by Aquagri Processing Private Limited, a company formed by former Pepsi officials to which Pepsi transferred its seaweed business operations in India along with a global patent.

Since seaweed is being grown as a cash crop which is exported as raw material for extracting carrageenan, it is subjected to fluctuations in international markets. The price spread along the value chain is also large: the price is US\$0.05.kg⁻¹ for wet weight, US\$0.41. kg⁻¹ for dry weight (conversion ratio 1:10) and US\$7-10. kg⁻¹ (conversion ratio 1:30) for refined carrageenan. Domestic processing facilities are being developed now in India. Apart from carrageenan, other products like liquid bio-fertiliser and cattle feed supplements are derived from seaweeds.

Seaweed farming receives support from the State in terms of a subsidy (50% of the project cost but limited to a maximum of US\$227 person⁻¹) as well as capacity building support. In the absence of leasing policies, the State exercises control in two ways: one, by making training in seaweed cultivation by a State-run training institute compulsory; and two, by restricting the

cultivation to persons holding a food ration card for the Public Distribution System. A group comprising five members is allowed to grow 45 rafts (1 x 1 m size) each. Though the crop duration is 45 days, farmers ensure continuous harvests through staggered planting. A one hectare farm can yield a net income of US\$10,409 with a total cost of production US\$15,772 and gross revenue of US\$26,181 (Krishnan and Narayankumar, 2010). The monopsony enjoyed by Aquagri in the market has been recently shaken with new entrants like SNAP.

Kappaphycus is an introduced crop and, therefore, allegations of bio-invasion threats have been made, mainly because the Gulf of Mannar is a marine sanctuary. Although seaweed culture is now allowed only in Palk Bay, accidental entry of *Kappahycus* is (controversially) alleged to have the potential to cause damage to coral reefs in the Gulf of Mannar. This demands the attention of coral reef ecologists.

Open sea cage farming

Open sea marine cage culture is the latest innovation in Indian mariculture. The logic of floating cage culture is the conversion of marine space into a controlled production system. In India, the first open sea cage farming was demonstrated in Visakhapatnam in 2007-08 by CMFRI. The frontline demonstrations were conducted in 10 more locations from 2008 to 2010 under a Public-Private Partnership mode where the project cost was met by the National Fisheries Development Board (NFDB) under the Ministry of Agriculture. The technology was transferred to selected fishermen's groups who received financial support from NFDB and technical backup from CMFRI.

When contemplating importing cage culture technology from Norway in the early 2000s, the cost of installation of the cages was of the order of tens of millions of rupees. The high cost discouraged many interested entrepreneurs. Moreover, no country was willing to share the technology *per se*. Once the cages were designed and fabricated indigenously, the cost of investment was scaled down from about US\$11,364 for a 15m diameter cage to US\$1,364 (for an epoxy-coated cage of 6m diameter excluding nets) over a span of four years of R&D effort. In 2010, the average revenue realized through open sea cage farming was US\$9,090 depending on the species (sea bass or lobster) farmed. The capital turnover ratio (with respect to sea bass cage farming) works out to be 2.54 with a benefit:cost ratio of 2 (at 20% discount rate). The innovation is on the verge of takeoff on a wider scale of adoption. Currently about 600 people are engaged in open sea cage farming in 11 locations.

Because the marine fisheries production of India is plateauing at around 3.0 million tonnes, the scope for further increases in capture fish production is limited. In this situation, meeting the Indian XII Five Year Plan target of 12 million tonnes in total fish production is a big challenge. But the Indian EEZ, with an area of 2.02 million square km, if viewed as an alternate food production system, apparently offers immense potential by way of mariculture. This is the potential that the CMFRI innovation aimed to tap for the benefit of the coastal communities. Open sea cage farming,

which is being operated and owned as a community enterprise, has come as a boon to the multitude of coastal stakeholders.

Gender issues across the technologies

Table 1 below reveals common issues of interest for a gendered reading of the political ecological context of the three mariculture innovations discussed above. The elements of comparison in the Table have been used to work out four cross cutting gender issues that follow.

Table 1. Mariculture in India - a comparative overview.

Element of comparison	Seaweed farming	Mussel farming	Open sea cage culture
Technology details			
• Type	Raft farming	Rafts	HDPE* cages
• Source	CSMCRI	CMFRI	CMFRI
• Promoter	A transnational company (PEPSICO)	A national research institute (CMFRI)	CMFRI
• Epicenter of diffusion	Gulf of Mannar and Palk Bay	Padanna, Kerala	Visakhapatnam, Andhra Pradesh
• Year of demonstration	2000-02	1995-96	2007
• Diffusion status	Large scale	Large scale	Niche
• Crop window	45 days	6 months	9-12 months
Social and economic dimensions			
• Gender	Largely feminine	Largely feminine	Masculine
• Market	Export	Domestic	Domestic
• Recent drivers in value chain	Domestic production of seaweed sap	Technology for extracting green mussel extract	Low cost cages
• Value chain integration	Mostly as raw material exported	Domestic consumption	Domestic consumption
• Property rights regime	Common property resource	Lease + common property resource	Common property resource
• Resource conflicts	Not yet reported	With estuarine fishers	Nil

• Institutional support	Bankable project	NABARD* approved	NFDB support
	Subsidy to groups	Subsidy to SHGs under Kudumbasree programme	
• Ownership unit	5 member group	SHGs mostly female , men's SHGs also allowed	Fishermen groups
	Condition for at least one woman per group removed recently		
• Human resource development support	Training by Fisheries Department	Training by CMFRI	Training by CMFRI
• Sourcing of wild seed done by	Women	Men (women purchase)	Men (women purchase)
• Livelihood option substituted	Seaweed collection	Collection from wild, fishing,	Fishing
	Fishing		

*HDPE=high density polyethylene; SHG=self help group; NABARD=National Bank for Agriculture and Rural Development.

1. Mariculture as women's empowerment platform

Except for open sea cage farming technology, mariculture has proved to be a successful platform for women's empowerment. In the cases of mussel and seaweed farming, women adopters had earlier depended on collecting natural resources (clams and seaweed, respectively) from the wild for their livelihood. Wild collection was more labour intensive. Their empowerment was manifested as economic (improved income under their control), political (more women members in the decision making bodies), and social (women able to exercise group pressure to eliminate or diminish vices like alcoholism, afford to send children to school for longer durations and prevent dropouts). The availability of disposable income has improved many women's "fall-back position" which in turn has increased their "bargaining power". A common mode of savings observed used by the women farmers was purchasing gold for their daughters, a tactic generally kept as a secret from their husbands. The women's self perception also has undergone positive changes. They reported "feeling more confident to meet government officials", "mustering courage to question consumption of spouses", "being able to appease mother-in-law with a saree which in turn helps to command respect". Expressions such as "able to buy foods of choice" or "afford to buy rations during lean seasons" were more often heard among women seaweed farmers of Tamil Nadu than mussel farmers of Kerala. This indicates the inherent difference in the level of living standards existing between the two locations namely Tamil Nadu and Kerala.

2. Erosion in State support for women's empowerment

This is a serious problem which demands more attention from gender scholars. When started, the State promoted mussel and seaweed farming as women-only enterprises. In the case of mussel farming, the frontline demonstrations initiated by CMFRI were supported by State agencies such as Development of Women and Children in Rural Areas (DWCRA) which was further carried forward by the *Kudumbasree* programme, a Kerala Government women's empowerment networking initiative. Since these agencies had women's empowerment as their stated mission, financial support in terms of subsidies and loans were provided only to women farmers. But once the profitability of the technology was established by the women's SHGs, the enterprises became bankable and banks came forward with loans. However, the banks could not keep the slogan of women's empowerment for long as competition in the banking sector increased after liberalization of the economy. "Initially they (men farmers) had to include at least a few of us (women) as members in the group to avail of loans, ... and we felt a superiority ...but now banks give loans to all-men groups also, so we are now competing with men" said a woman mussel farmer in Padanna. Though the women mussel farmers don't find getting bank loans difficult, they feel that they are being deprived of the monetary and consequent privileges they had previously enjoyed. With men starting their own SHGs, inputs like labour and quality seeds are becoming more expensive and effective operational aquatic space is getting reduced. These female mussel farmers fear they may lose out to the male "muscle power" soon. It is suspected that the phenomenon of "male dominated monopolisation" of profit from common property resources is emerging as another reason for marginalization of women.

The case of seaweed farming is slightly different but similar. The experimental stage of *Kappaphycus* culture (2000-2002) was financed fully by the transnational company. But the diffusion stage (2004-2005 onwards) received financial support from the State through SHGs. Since in Tamil Nadu it is mandatory to have 50% women members in each SHG, the room for gender imbalance is less. But, as in the case of mussel farming, the profitability of seaweed farming is luring more men's groups to the enterprise and banks have come forward to assist them with loans.

3. Feminization losing grip in maricultural space

Coastal/maricultural space is becoming masculine despite the avowed earlier objectives of women's empowerment by the State. In 2010, the upper house of the Indian parliament passed the much-debated Women's Reservation Bill which will ensure that 33% of positions in all elected decision-making bodies are reserved for women. Thus, while on the one hand the State legitimizes genuine gender concerns on a macro-political level, it is becoming invisible, perhaps satisfying a neo-liberal agenda, in those very spheres where women were historically rendered as invisible entities both economically and politically.

4. Gender balancing or biasing Common Property Rights?

New drivers are appearing in the value chains for marine products. For example, in the case of mussel farming, CMFRI has developed technology to extract a nutraceutical called green mussel extract; and in the case of seaweed farming, domestic processing facilities and new products are now available. The prospects of these mariculture technologies being disseminated more widely are bright. As competition increases, the expansion in farming area will make it a contested space. Thus, it is the benign duty of the State to come out with proactive, rational and gendered leasing policies to keep these enterprises robust. Such policies should also take into consideration the ecological vulnerability of these fragile ecosystems.

Most accept the truism that women tend to be the better economic stewards at home. They are expected to be otherwise when it comes to ecological stewardship. Responsible management of natural resources depends on a sense of ownership. Unlike landed communities, the concept of inherited property rights is alien among fishing communities and this makes fisherwomen more likely to be disempowered. Inheritance of means of production like fishing vessels and gears strictly follow notions of patriliney in the communities studied in all the locations. The dowry system, though legally banned in India, is still prevalent among the coastal communities. The grave concern “they (men) can go back to the sea, but where shall we go” raised by women mariculturists needs to be addressed by the State.

In this context, a marine common property leasing policy should have an inherent feminine bias which can be pragmatically defended by keeping the shallow water areas in the sea (for example, up to a depth of 6 m) reserved for women mariculture farmer groups alone. This depth is sufficient to establish even an open sea cage culture unit. A lease amount can be fixed as the license fee, based on the production and income realised by the women farmers. In 2000, even Pepsico paid the Tamil Nadu Government a fee, in this case about US\$4,500 for a 10 km stretch of bay. But future lease deeds or licenses must rest securely with the women's groups. Carrying capacity studies should be mandatory before renewing year to year licenses. Incentives, such as concessions in the lease amount, can be given to those groups who ensure ecosystem health through responsible management measures.

Conclusions

As a sunrise enterprise, the mariculture enterprise in India is composed of three prominent technologies, namely mussel farming, seaweed farming and open sea cage farming. These provide alternative or, more correctly, additional income avenues to the coastal fisherfolk. Out of the three technologies which were subjected to a comparative analysis in a gendered political ecology context, two technologies, mussel farming and seaweed farming, were found to act as women's

empowerment platforms on economic, social and political dimensions. However, women's assurances to continue using these technologies as empowerment platforms are getting vitiated by emerging issues. The most important one is the ambivalence shown by the State. On the one hand, it manifests itself as a positive "bargaining" force in the intra-household domestic space by providing State-sponsored platforms through the Self Help Groups, while on the other hand, staying outside the "common access resource" space, from which these platforms gain sustenance, and thus rendering the space less amenable to its democratic ideals.

Only a visible State can bring fisher-women out of sociopolitical invisibility. Or will the market, instead, do the job, undercutting the role of mariculture as a women's empowerment platform? Nevertheless, it is time that gender scholars the world over are encouraged to proactively support the cause of women mariculturists by rallying behind the argument that leasing policy should be gender biased, protecting the interests and role of women farmers, rather than gender neutral.

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