

Women of tides: Gender analysis of wild seaweed harvesting in Tamil Nadu, South India

M. S. Ahila¹, Neha W. Qureshi¹, Shivaji D. Argade¹, P. S. Ananthan¹ and B. Johnson²

¹ICAR-Central Institute of Fisheries Education, Mumbai - 400 061, Maharashtra, India

²Mandapam Regional Centre of ICAR-Central Marine Fisheries Research Institute, Mandapam - 623 520, Tamil Nadu, India



Abstract

Seaweed production in India is primarily confined to the Gulf of Mannar and Palk Bay in Tamil Nadu, South India. Around 5,000 fishers in this region are involved in wild seaweed collection. Gathering the gender-disaggregated data, perhaps more qualitatively, explains gender differences and helps redress inequalities. With this rationale, a study was undertaken in the Ramanathapuram District, Tamil Nadu, with a sample of 60 households to assess the gender dimensions in wild seaweed harvesting. The social participation, extension participation, extent of usage of information sources, daily activity profile, drudgery, technology adoption, attitude towards seaweed harvesting/fishing as a livelihood, gender empowerment dimensions, gender needs and constraints were analysed. The study revealed that women have a prominent role in most activities in seaweed harvesting. There is a significant difference between men and women seaweed harvesters with regard to above aspects except for their attitude towards seaweed harvesting as a livelihood. Furthermore, a significant difference exists between women seaweed harvesters, men seaweed harvesters, and fishermen regarding various dimensions. Gender disparities exist in asset ownership, access to resources and services, usage of information sources and being overwhelmed with productive and reproductive roles. Strategies may include promoting joint ownership, gender-sensitive extension activities, gender-specific skill development, gender-friendly technological interventions and gender sensitisation.

Introduction

Small-scale fisheries contribute to nearly half of the global fish catch and employ over 90% of the workforce in fisheries sector, with women comprising approximately 50% primarily in roles related to marketing and processing (FAO, 2020). Among the total fisherfolk engaged in fishing and allied activities in Tamil Nadu, 72% are women (CMFRI-DoF, 2020). While men are predominantly engage in fishing, women play significant role in activities such as seaweed harvesting, collecting shellfish and oysters, as well as in processing and marketing these products (D'souza, 2020). Their involvement in these diverse tasks often surpasses that of men in terms of workforce numbers. Around 5,000 fishers in the Gulf of Mannar and Palk Bay region are involved in the wild collection of seaweeds (*Gelidiella acerosa*, *Gracilaria* spp.,

Sargassum spp. and *Turbinaria* spp.) for their livelihood and among the seaweed collectors majority are women (Johnson *et al.*, 2017).

The work of women in fisheries has been invisible and undervalued for decades (Neilson *et al.*, 2019). An unpaid woman's services are not measured in financial terms and are not fully acknowledged in the fishing communities worldwide (De Silva, 2011). Women play multi-faceted roles including productive, reproductive and community responsibilities, but their contributions often go unrecognised or remain largely invisible (D'souza, 2020). It is imperative to describe women's situations in relation to men and explore and understand inequalities and discrimination between men and women and their causes. We must gather the gender-disaggregated data, perhaps more qualitatively and try to explain the gender differences related



*Correspondence e-mail:

nehaq@cife.edu.in

Keywords:

Gender analysis, Gender empowerment dimensions, Seaweed harvesters, Wild seaweed harvesting

Received : 22.08.2023

Accepted : 08.12.2024

to the specific fishery tasks we want to highlight. In relation to power, one can look at women's and men's participation in decision-making, resources management, and policymaking for everyday life in households (Stacey *et al.*, 2019). An in-depth gender analysis that considers gender roles and relations, assets and capabilities and empowerment is needed apriori to any policy formulation for sustainable development (Nikita *et al.*, 2012). Gender analysis helps redress inequities and it also serves as the foundation for tackling disparities in policies, programs and projects. In this context, the present study focuses on the objectives of studying the gender dimensions of wild seaweed harvesters in addition to capturing their socio-economic profile.

Methods

Wild seaweed collection through diving started commercially in the late 1960s, with women collecting the seaweed varieties of *Gelidiella* spp., *Gracilaria* spp., *Sargassum* spp. and *Turbinaria* spp. in the Gulf of Mannar region (Ramachandran, 2012). Gulf of Mannar has a coastline of 364.9 km along the Ramanathapuram (141 km), Tuticorin (163.5 km), Tirunelveli (48.9 km) and Kanyakumari (11.5 km) Districts of Tamil Nadu. Seaweed harvesting is mainly concentrated in the 'seaweed belt' that runs along the coast of Ramanathapuram District (Coppen and Nambiar, 1991).

Chinnapalam, situated on Rameswaram Island (Fig. 1), is the largest seaweed harvesting village along the coast, where over two hundred people harvest seaweed, predominantly women (Table 1). A sample of 60 households were selected randomly and both men and women counterparts of the household were separately interviewed. As men are involved only to a lesser extent, the sampling comprised of 60 women seaweed harvesters, 12 men seaweed harvesters and 42 fishermen adding up to a total sample size of 114 (proportionate sampling).

The data regarding social participation, extension participation, extent of usage of information sources, daily activity profile, drudgery level, level of technology adoption, attitude towards

livelihood, gender empowerment dimensions (access to resources and services, decision making, participation and capability), gender needs and gender constraints were collected through personal interviews of the respondents with the help of a pre-tested well-structured interview schedule. All of these dimensions and sub-dimensions were assessed using a series of inventories that has appropriate questions categorised as always, occasionally and never on a 3 point Likert scale. Positive questions were scored with a pattern of 3, 2 and 1 and *vice versa* for negative questions to avoid response bias. The values for each dimension and sub-dimensions were normalised using the formula (Bobbitt, 2021);

$$z_i = [x_i - \min(x)] / [\max(x) - \min(x)]$$

where, z_i : i^{th} normalised value in the dataset

x_i : i^{th} value in the dataset

$\min(x)$: Minimum value in the dataset

$\max(x)$: Maximum value in the dataset

Data analysis was done with descriptive statistics such as mean, frequency and percentages. Mann Whitney U test and Kruskal Wallis test have been used to find out the significant difference between men and women on various dimensions and sub-dimensions.

Gender drudgery level was calculated using the gender drudgery index (Suresh and Dudhal, 2017):

$$\text{Overall drudgery index of } j^{\text{th}} \text{ respondent} = DI_j = \frac{1}{m_j} \sum_{i=1}^{m_j} DI_{ij} \text{ where,}$$

$$X_{ij} = \frac{x_{ij} t_{ij}}{\sum_{i=1}^7 x_{ij} t_{ij}} ; Y_{ij} = \frac{Y_{ij}}{5} ; Z_{ij} = \frac{Z_{ij}}{5} \quad i = 1(1)7; j = 1(1)n;$$

n = Number of respondents

m_j = Number of activities performed by j^{th} respondent (7 activities)

x_{ij} = Average time spent in minutes in a day by j^{th} respondent in i^{th} activity

t_{ij} = Number of days j^{th} respondent performed i^{th} activity

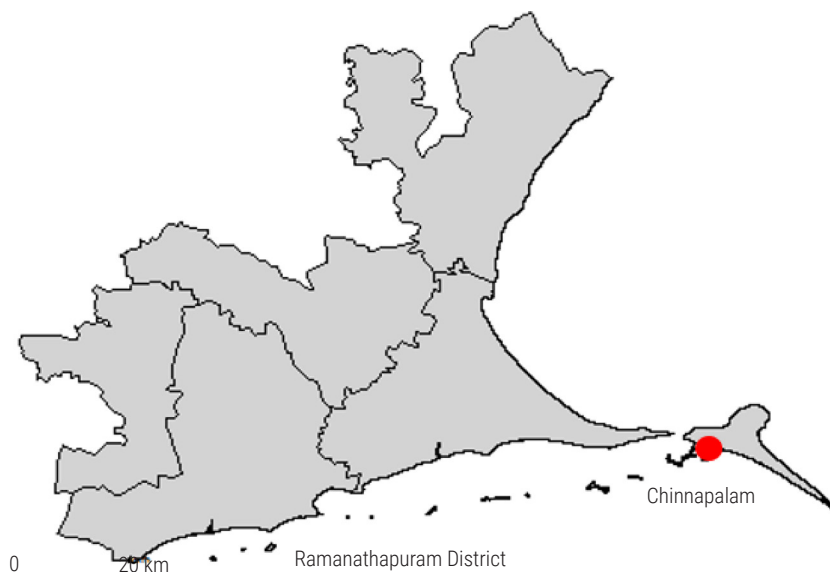


Fig.1. Map showing the study area

y_{ij} = Relative score related to the frequency of work for j^{th} respondent in i^{th} activity takes value 1-Seasonal, 2-Fortnightly, 3-Weekly, 4-Alternate-day, 5-Daily

z_{ij} = Relative score related to the degree of difficulty for j^{th} respondent in i^{th} activity, takes value 1-Very easy, 2-Easy, 3-Somewhat difficult, 4-Difficult, 5-Very difficult

The gender needs and gender constraints were ranked using the Rank Based Quotient.

$$\text{R.B.Q} = \frac{\sum f_i (n+1-i)}{N \times n} \times 100$$

where, f_i = Number of respondents reporting a particular problem under i^{th} rank

N = Sample size

n = Number of problems identified

Results and discussion

General profile of Chinnapalam seaweed harvesters

In Chinnapalam, both women and men collect seaweed, but the number of women that partake in this activity outweighs the number of men. The majority of the people residing in this area are engaged in sea-based activities, such as fishing and seaweed collection. Seaweed collection is an important secondary source of income for most households. They collect only *Gelidiella acerosa*, locally known as *marikozhunthu*, which fetches ₹50 per kg (dry weight). In Chinnapalam, the seaweed collection was carried out only 12 days in a lunar month. The average number of days for seaweed harvesting per year is 97 days. They do not venture into the sea during the fishing ban period (15 April-14 June). But the fisheries department allow only men as heads of families to get social benefits during the fishing ban period since these benefits should cover the family's needs. The gender implications of this compensation policy, apparently based on the assumption that men are the traditional head of the family and women are only their dependents, were not, however, discussed (Narayanan, 2014). The total number of households in the village is 199 with a total fisherfolk population of 909 (Table 1).

Socio-economic profile of seaweed harvesters

The village people are predominantly Hindus and belong to the Mutharaiyar Community, categorised as 'Most Backward Caste'. The majority of the women (65%) and men (64.81%) respondents were middle-aged (36-57 y) with an average age of 48 and 45 years, respectively. About 80% of women and 64.81% of men respondents

Table 1. General profile of Chinnapalam Village

Total households	199
Total fisherfolk population	909
Sex ratio (females per 1000 males)	930
Non-motorised crafts	78 (57.78%)
Motorised craft	57 (42.22%)

(Source: Marine Fisheries Census, CMFRI, 2020)

were illiterate. For 86.67% of women, seaweed harvesting was the main occupation, whereas for 22.22% men, it was a secondary occupation. Fishing was the main occupation for men (100%). Average harvest of *G. acerosa* per person per trip of women and men seaweed harvesters were 11.08 and 15.25 kg, respectively.

Table 2 shows that most of them (63.34%) reside in a pucca house which was in consonance with the Marine Fisheries Census of Tamil Nadu (CMFRI, 2016), of which, 71.67% of houses were owned by men. The study reflects that 81.67% belong to nuclear families with an average family size of 4, consistent with the state average of 4 for fishermen families reported by the Marine Fisheries Census (CMFRI, 2020). Around 56.67% of households were headed by men and 43.33% by women, whereas Krishnan and Narayanakumar (2010) reported that 64% of family heads of seaweed farmers in Mandapam and 66% in Rameswaram are men. Majority of the boats were owned by men (81.39%). Women contribute 29.14% of total household income, of which 67.50% is from seaweed harvesting.

Gender dimensions

The various gender dimensions such as social participation, extension participation, the extent of usage of information sources, daily activity profile, drudgery level, technology adoption, attitude towards seaweed harvesting/fishing as a livelihood, gender empowerment dimensions (access to resources and services, decision making, participation and capability), gender needs and constraints were analysed (Fig. 2).

Social participation

Over 73% of women and 72% of men actively participated in village panchayats and religious institutions, respectively. Women (46.67%) exclusively participated in self help groups (SHGs viz, Sevvanti SHG, Natchathirameengal SHG, Karumariamman SHG and Sithivinayagar SHG). Both men and women (above 18 and below 60 years) were members of fisher's cooperative societies and they availed the National Fishermen Savings-cum-Relief (NFSR) scheme. Mann Whitey U test revealed a significant difference between men (0.49) and women (0.61) concerning social participation ($p < 0.001$). Immanuel and Sathiadas (2004) found that roughly 70% of women seaweed collectors had a medium to a high degree of social involvement. In contrast, this study reported that over a period of time, there was a drastic improvement in social participation, it was seen that 95% of women have a medium to a high level of social participation. Table 3 presents that 88% of men have low to medium level of social participation.

Extension participation

Training on seaweed farming, field demonstrations and ornamental fish culture was attended by 51.67, 41.67 and 38.33% of women. Fishery advisory services and cage culture training were attended by 40.74 and 35.19% of men. The study reported that 91.67% of women have a low to medium level of extension participation, which is inconsistent with Immanuel and Sathiadas (2004) i.e., 73% of women fall under low to medium level. From Table 3, it can be seen that about 96% of men have a low to medium level of extension participation. Mann Whitey U test reveals a significant difference between men (0.27) and women (0.36) in extension participation ($p = 0.038$).

Table 2. Socio-economic profile of seaweed harvesters

Profile characteristics		Categories					
		Young (<36 years)	Middle (36-57 years)			Old (>57 years)	
Age	Men	12.96%		64.81 %	22.22 %		
	Women	21.67%		65 %	13.33 %		
Education		Illiterate	Primary	Middle	Secondary		Higher secondary
	Men	64.81%	27.78%	7.41 %	-		-
	Women	80%	6.67%	6.67%	3.33%		3.33%
Occupation		Seaweed harvesting	Fishing	Seaweed harvesting + fishing	Seaweed harvesting+ threading shell garlands	Seaweed harvesting+ threading shell garlands + fishing	Seaweed harvesting + others
Experience in seaweed harvesting	Men	-	77.78%	22.22%	-	-	-
	Women	8.33%	-	36.67%	23.33%	18.33%	13.33%
		<16 y		16-42 y	>42 y		
	Men	16.67 %		58.33 %	25 %		
	Women	21.67%		63.33%	15%		
Type of house		Pucca		Kutcha	Semi-pucca		
		63.34%		18.33%	18.33%		
Gender of house owner	Men	71.67%					
	Women	26.67%					
Gender of the boat owner	Men	81.39%					
	Women	18.60%					
Family type		Nuclear		Joint			
		81.67%		18.33%			
Family size		>2		2 – 5	>5		
		1.67%		90%	8.33%		
Gender of family head	Men	56.67%					
	Women	43.33%					
Average annual income from seaweed harvesting	Men	₹86,566					
	Women	₹64,357					
Average annual income	Men	₹1,90,526					
	Women	₹95,342					

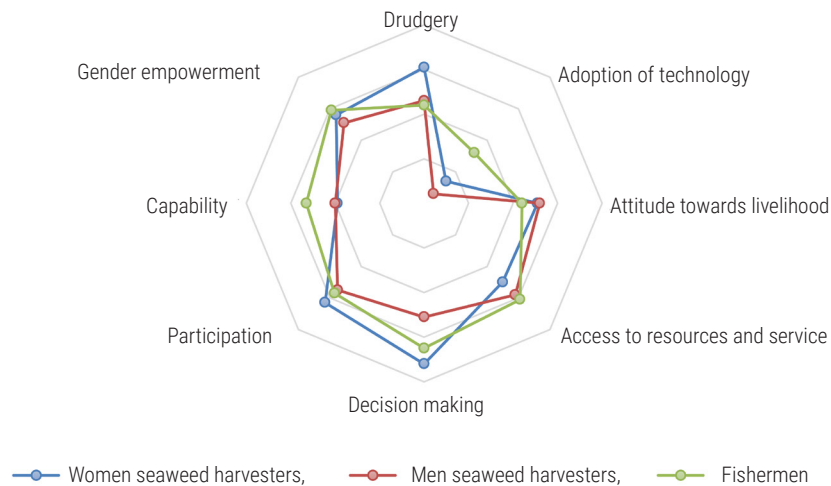


Fig. 2. Radar representation of gender dynamics in gender dimensions of seaweed harvesting and fishing

Table 3. Difference between men and women in social participation, extension participation and usage of information sources

Variables		Men (n=54) (%)	Women (n=60) (%)
Social participation	Low	14.81	5
	Medium	74.07	55
	High	11.11	40
Extension participation	Low	38.89	25
	Medium	57.41	66.67
	High	3.70	8.33
Extent of usage of information sources	Low	24.07	31.67
	Medium	70.37	66.67
	High	5.56	1.67

*Low- <0.33, Medium- 0.33 to 0.66, High- >0.66

The extent of usage of information sources

Neighbours are the major source of information for 95% of women and 88.89% of men. About 35% of women and 51.85% of men listen to community radio called *kadalosai*, which broadcasts weather conditions, potential fisheries zone, fish prices, fuel rates and alternate livelihood options. Over 98.34% of women and 94.44% of

men use information sources to a low to medium extent (Table 3). Mann Whitey U test disclosed a significant difference between men (0.43) and women (0.34) in the extent of usage of information sources ($p < 0.001$).

Daily activity profile of seaweed harvesters

According to De Silva (2011), men and women play distinct roles depending on culture, beliefs, attitudes and norms. The unpaid reproductive work burden within the household is coupled with the heavy productive work burden and community-level work burden, resulting in a triple work burden for women working in agriculture, fisheries and aquaculture (FAO, 2020). A perusal of the Table 4 reveals that, on an average, women seaweed harvesters work 3 h 30 min, more than men seaweed harvesters by combining both productive and reproductive activities, which is similar to the results of Ganeshkumar (2021). The majority of reproductive roles were done by women, which aligns with Yadav and Sharma (2017). Women seaweed collectors spent 10 h and 05 mins/ per day on productive work, whereas men's involvement was reported to be 9 h and 50 min per day. Women spent an average of 4 h and 45 min per day in household work, whereas men spent only 1 h 30 min on these activities.

Table 4. Daily activity profile of seaweed harvesters

Women seaweed harvesters (n=60)		Men seaweed harvesters (n=12)	
Activities	Time	Activities	Time
a) Productive work			
Prior arrangements for harvesting (taking the equipment, tying the sack around their waist, wrapping clothes around their fingers and banding it, wearing shoes/ slippers etc.)	45 min	Prior arrangements for harvesting (checking the diesel level/taking the vathai to the shore, tying the sack around their waist, wearing shoes/ slippers etc)	1h
Travel time	2 h 30 min	Travel time	2 h 30 min
Seaweed harvesting (diving, collecting, filling their sacks and loading to the boat)	2 h	Seaweed harvesting (diving, collecting, filling their sacks and loading to the boat)	2hrs
Unloading the seaweed from the boat to the drying area	20 min	Unloading the seaweed from the boat to the drying area	20 min
Removing other seaweed species (except <i>G. acerosa</i>) and stones and spreading it for drying	1h 30 min	Removing other seaweed species (except <i>G. acerosa</i>) and stones and spreading it for drying	1h 30min
Packing, weighing and selling out	2 h 30 min	Packing, weighing and sold out	2 h 30 min
Threading shell garlands	30 min		
Total productive work hours	10 h 5min	9 h 50 min	
b) Reproductive work			
House cleaning	15 min	Fetching water	30 min
Cooking	2 h	Buying groceries	30 min
Serving food and washing utensils	1 h 30 min	Child care	30 min
Washing clothes	30 min		
Child care	30 min		
Total reproductive work hours	4 h 45 min	1h 30 min	
c) Personal work hours			
Having food	45 min	Having food	50 min
Taking a shower, personal grooming, etc	55 min	Taking a shower, personal grooming, etc	1h 5min
Total personal work hours	1h 40 min	1h 55 min	
d) Leisure hours			
Rest	30 min	Rest	1h 45 min
Watching TV, spending time with neighbours, etc	1h	Watching TV, spending time with neighbours, etc	1h
Total leisure hours	1h 30 min	2 h 45 min	
e) Sleeping hours			
	6 h	Sleeping hours	8 h

Drudgery

a) Drudgery in seaweed harvesting

There were seven activities such as boat operation (paddling/motor boat operation), seaweed collection, unloading the seaweed from the boat and taking to the drying area, sorting and drying, packing, loading and selling it to the agent. Table 5 presents that for both men (66.88) and women (68.82) seaweed harvesters, seaweed collection being the most drudgery-prone activity. Selling seaweed to the agent and packing seaweed were the least drudgery-prone activities for men (37.44) and women (40.48) seaweed harvesters, respectively. From Table 7, it can be seen that almost half (51.7%) of the women seaweed harvesters reported a high drudgery level in seaweed harvesting, compared to just 8.33% of men harvesters. Mann Whitney U test revealed a significant difference between men and women seaweed harvesters regarding drudgery level in seaweed harvesting (Table 8).

b) Drudgery in fishing

The seven activities involved were fishing, boat operation, harvesting, marketing, loading and unloading, net repairing and icing. Table 6 shows that harvesting (68.59) is the most drudgery-prone activity for fishermen followed by net repairing (65.54) and boat operation (63.19). Icing (38.96) was less drudgery-prone activity which is similar to the study reported by Ganeshkumar (2021). A vast majority (90.47%) of fishermen felt low to medium level of drudgery in fishing (Table 7). From Table 8, Kruskal Wallis test shows a significant difference between women and men seaweed harvesters and fishermen regarding drudgery level in seaweed harvesting and fishing.

Technology adoption

A common global trend involves diving without gear or protection, often while wearing a mix of traditional and modern clothing (McCurry, 2006). The respondents use goggles, clothes wrapped around their fingers and tied with rubber bands, a large sack tied around their waist to collect seaweed as well as slippers/shoes. They hand pluck the seaweeds without using any equipment and there is a lack of technology adoption in seaweed harvesting. Around half (48.33%) of women seaweed harvesters use motorised boats, whereas only 16.67% of men seaweed harvesters use motorised boat during harvesting. Also, goggles were not worn by men. In case of fishing, fishermen fall under low to medium level of technology adoption (Table 7). More than half (59.52%) of fishermen use the motorised boat, 50% use GPS in their boat, 61.90% use insulated

Table 6. Drudgery level in fishing

Activities	Fishermen (n=42)
Fishing/net setting	57.55
Boat operation	63.19
Harvesting/net hauling	68.59
Marketing	44.83
Loading and unloading	46.74
Net repairing	65.54
Icing	38.96

boxes and all use machine braided nets for fishing. Small low-value fish (mainly silver biddy) are salt-dried by only 26.19% of fishermen mostly for domestic consumption. Table 8 shows a significant difference between the groups 2 and 3 concerning the adoption of technology.

Attitude towards livelihood

Table 7 shows majority of women (96.67%) and men (100%) seaweed harvesters and 80% of fishermen reported a favourable to most favourable attitude towards seaweed harvesting/fishing as a livelihood. Table 8 points out that there is no significant difference between men and women seaweed harvesters regarding attitude towards seaweed harvesting as a livelihood. But there is a significant difference between men, women seaweed harvesters, and fishermen in this aspect.

Gender empowerment dimensions

Access to resources and services

Gender relations, the social relationships determined by expressions of power between men and women (FAO, 2017), have direct impact on access to and control over, livelihood assets (including natural resources) as well as the nature and distribution of benefits of livelihood activities. Seaweed harvesters (both men and women) and fishers are availing the group accident insurance for active fishermen. Seaweed harvesters have no license for seaweed harvesting, but the fishermen have a license for fishing. Almost all the respondents have access to banking services. The study reported that men had more access to household and productive resources. Vipinkumar *et al.* (2020) stated that with respect to access to resources in seaweed farming, most of the items are dominated by men. Significantly, the financial transaction was under women's control, which is in line with the findings of Vipinkumar *et al.* (2013). Yadav and Sharma, (2017) reported that men had greater access and control over household, fishery and

Table 5. Drudgery level in seaweed harvesting

Activities	Women seaweed harvester (n=60)	Men seaweed harvester (n=12)	p values
Boat operation	53.02	60.99	0.039
Collecting seaweed	68.82	66.88	0.071
Unloading seaweed and taking it to the drying platform	62.87	53.59	0.004
Sorting and drying seaweed	61.45	50.10	0.001
Packing the dried seaweed	40.48	44.11	0.029
Loading the seaweed	48.65	50.77	0.000
Selling the seaweed to the agent	50.89	37.44	0.001

Table 7. Percentage values of gender dimensions of seaweed harvesting and fishing

Variables	Categories	Women seaweed harvesters (n=60) (%)	Men seaweed harvesters (n=12) (%)	Fishermen (n=42) (%)
Drudgery	Low	5	16.67	33.33
	Medium	43.33	75	57.14
	High	51.67	8.33	9.52
Adoption of technology	Low	100	100	50
	Medium	-	-	50
	High	-	-	-
Attitude towards livelihood	Low	3.33	-	19.05
	Medium	85	100	73.81
	High	11.67	-	7.14
Access to resources and service	Low	1.67	-	-
	Medium	95	75	57.14
	High	3.33	25	42.86
Decision making	Low	6.67	33.33	14.29
	Medium	16.67	41.67	14.29
	High	76.67	25	71.43
Participation	Low	3.33	-	-
	Medium	53.33	83.33	88.10
	High	43.33	16.67	11.90
Capability	Low	45	66.67	-
	Medium	46.67	16.67	83.33
	High	8.33	16.67	16.67

*Low- <0.33, Medium- 0.33 to 0.66, High- >0.66

Table 8. Significant values of gender dimensions of seaweed harvesting and fishing

Variables	Women seaweed harvesters (n=60) (1)	Men seaweed harvesters (n=12) (2)	Fishermen (n=42) (3)	p values for (1) and (2)	p values for (1), (2) and (3)
Drudgery	0.61	0.46	0.44	0.012	0.048
Adoption of technology	0.14	0.06	0.32	0.000	0.000
Attitude towards livelihood	0.51	0.52	0.44	0.789	0.018
Access to resources and service	0.50	0.58	0.61	0.018	0.000
Decision making	0.72	0.51	0.65	0.005	0.007
Participation	0.63	0.55	0.57	0.043	0.010
Capability	0.39	0.40	0.53	0.836	0.000
Gender empowerment	0.56	0.51	0.59	0.002	0.000

financial resources when compared to women. Over 95% of women seaweed harvesters have medium level of access to resources and services, whereas all men seaweed harvesters and fishermen have medium to high access (Table 7). Scrutiny of Table 8 discloses a significant difference between the groups 2 and 3 regarding access to resources and services.

Decision making

Women seaweed harvesters dominate in the decision-making related to seaweed harvesting activities than men seaweed harvesters. In contrast, the decision-making aspect of seaweed farming was being accomplished by the men in most activities (Vipinkumar *et al.*, 2020). Vipinkumar *et al.* (2017) reported that most of decisions were made by women in dry fish enterprise. It was observed that decision-making for marketing was a women-dominated activity. Women are more likely to make financial decisions than men. On availing of credit, most of the respondents

make decisions in collaboration with their spouses. Fishermen itself took decisions related to fishing activities. Larger part (93.34%) of women and 75% of men seaweed harvesters have a medium to high and low to medium level of decision making, respectively. About 85% of fishermen have medium to high level of decision making (Table 7). Table 8 shows significant difference between the groups 2 and 3 regarding decision-making.

Participation

The study revealed that women have significant involvement in buying the inputs, collecting the seaweed, drying and in marketing segments than men seaweed harvesters. In contradiction, in the case of seaweed farming, most of the activities were men-dominated (Vipinkumar *et al.*, 2020). Fishermen actively participate in buying inputs for fishing and selling the harvest, SHGs and other institutions are mostly used by women to obtain loans. Perusal of Table 7 shows over 96% of women have a medium to

a high level of participation while all men seaweed harvesters and fishermen fall under medium to a high level. Table 8 indicates a significant difference between groups 2 and 3 with respect to participation.

Capability

Nearly 1/4th of the men and women respondents can read and write in their regional languages, *i.e.*, Tamil. Around 9% of women can use mobile internet, while 18% of men can use it to get the required information. Only 5% of women knew agar preparation from the seaweed but were not practising it. Fishermen knew the preparation of dry fish, but only a few practiced. Majority (91%) of women and men (83%) seaweed harvesters fall under low to medium level, whereas all fishermen fall under medium to a high level of capability (Table 7). Women and men seaweed harvesters can manage all seaweed harvesting activities. Table 8 points out no significant difference between men and women seaweed harvesters regarding capability. But there is a significant difference between men and women seaweed harvesters and fishermen in this aspect.

The gender empowerment dimensions were worked out based on four sub-dimensions such as access to resources and services, decision making, participation and capability. The results show that women seaweed harvesters (0.56) were empowered more than the men seaweed harvesters (0.51) as it was the main occupation for

the majority of the women and they were actively involved in this activity.

Gender needs

Table 9 indicates that the major resource need of women seaweed harvesters was to procure the harvest in wet form and at a reasonable price, followed by protective suits and equipment. The major resource need identified by men seaweed harvesters were motorised boats, followed by a preference for procuring the harvest in wet form and at a reasonable price, and so on. Women seaweed harvesters perceived that the major training need was training on seaweed farming, followed by value addition and by men seaweed harvesters were on cage culture and engine repairing. The major information need perceived by women seaweed harvesters was credit schemes, and by men seaweed harvesters were subsidies.

Gender constraints

Table 10, suggests that the major constraint women seaweed harvesters face is overburden, reduced income, health hazards (skin infections and body pain) and so on, whereas men seaweed harvesters encounters escalating fuel cost and reduced yield.

Overall, the study found that the women counterparts had a significant and definite role in most activities in seaweed

Table 9. Gender needs of seaweed harvesters

Women seaweed harvesters (n=60)		Men seaweed harvesters (n=12)	
Needs	RBQ	Needs	RBQ
(a) Resource needs			
Prefers to procure the harvest in wet form and at a reasonable price	94	Motorised boat	83.33
Protective suits, net bag, goggles, gloves and shoes/flippers	75	Prefers to obtain the harvest in wet form and at a reasonable price	81.67
Drying platform	63	Increase the amount of subsidised fuel	58.33
First aid kit and safety equipment	36.67	Drying platform	35
		Protective suits, net bag, goggles, gloves and shoes/flippers	30.21
(b) Training needs			
Seaweed farming	83.75	Cage culture	81.25
Value addition in fish/seaweed	70.42	Engine repairing	70.83
Ornamental fish culture	60.00	Seaweed farming	58.33
Cage culture	35.83	Ornamental fish culture	39.58
(c) Information needs			
Credit schemes	80.56	Subsidies	86.11
Subsidies	63.33	Credit schemes	63.89
Market information	56.11	Market information	50

Table 10. Gender constraints of seaweed harvesters

Women seaweed harvesters (n=60)		Men seaweed harvesters (n=12)	
Constraints	RBQ	Constraints	RBQ
Overburden	87.38	Escalating fuel cost/ transportation cost	90.28
Reduction in yield and income	80.48	Reduction in yield	77.78
Health hazard	63.57	Inadequate drying area	54.17
Threat from eel, rays and snakes	51.67	Threat from eel, rays and snakes	34.72
Having issues in answering nature's call	47.38	Health hazards	31.94
Alcoholic addiction of partner	42.14		
Inadequate drying platform	27.38		

harvesting, such as collecting the seaweed, drying, and marketing. They also have a prominent role in participation and decision making. Similar results were found in dry fish units, where most activities were carried out by women (Vipinkumar et al., 2017). Gender empowerment dimensions show that women seaweed harvesters were empowered more than the men. The daily activity profile disclosed that 1:30 pm to 3:00 pm could be opted to conduct extension activities to ensure equal and active participation of both men and women. Acquisition of fresh seaweed at a reasonable price would alleviate their toil.

Regarding various gender dimensions, there is a significant difference between men and women seaweed harvesters as well as between men seaweed harvesters, women seaweed harvesters and fishermen. Gender disparities exist in asset ownership, access to resources and services, usage of information sources and being overwhelmed with productive and reproductive activities. Strategies might include promoting joint ownership, subsidies to the women owned fishing boats/vessel, gender-sensitive extension activities, gender-specific skill development, gender-friendly technological interventions and gender sensitisation. A comparative study with gender dimensions in seaweed farming and wild seaweed harvesting need to be taken up on a large scale. Exhaustive research with a larger sample size covering more villages of Ramanathapuram District would be of ample scope.

Acknowledgments

The authors extend sincere thanks to Dr. C. N. Ravishankar, Director, ICAR-CIFE, Mumbai for providing support and to the respondents for their wholehearted cooperation rendered towards undertaking this study.

References

- Bobbit, Z. 2021. How to normalize data between 0 and 1. *Statology*. <https://www.statology.org/normalize-data-between-0-and-1/>.
- CMFRI-DoF 2020. *Marine fisheries census 2016- Tamil Nadu*. ICAR-Central Marine Fisheries Research Institute, Kochi and Department of Fisheries. Govt. of India, 308 p.
- Coopen, J. J. W. and Nambiar, P. 1991. *Agar and alginate production from seaweed in India*. Bay of Bengal Programme, Chennai, India, 32 p.
- De Silva, D. A. M. 2011. Faces of women in global fishery value chains: Female involvement, impact and importance in the fisheries of developed and developing countries. *NORAD/FAO Value Chain Project*, Norwegian Agency for Development Cooperation and Food and Agriculture Organisation of the United Nations, Rome, Italy, 49 p.
- D'souza, S. 2020. *Unmasking the silent role fisherwomen play in the small-scale fisheries local value chain in India*. M. A. Dissertation, International Institute of Social Studies, The Netherlands. <http://hdl.handle.net/2105/55967>.

- FAO 2020. *The state of world fisheries and aquaculture 2020: Sustainability in action*. Food and Agriculture Organisation of the United Nations, Rome, Italy.
- Ganeshkumar, K. 2021. *Gender dynamics in marine fisheries-based livelihood of Tamil Nadu*. M. F. Sc Thesis. ICAR-Central Institute of Fisheries Education, Mumbai, India.
- Johnson, B., Narayanakumar, R., Abdul Nazar, A. K., Kaladharan, P. and Gopakumar, G. 2017. Economic analysis of farming and wild collection of seaweeds in Ramanathapuram District, Tamil Nadu. *Indian J. Fish.*, 64(4): 94-99. <https://doi.org/10.21077/ijf.2017.64.4.61828-13>.
- Krishnan, M. and Narayanakumar, R. 2010. Socio-economic dimensions of seaweed farming in India. *CMFRI Special Publication No. 102*, ICAR-Central Marine Fisheries Research Institute, Kochi, India, 78 p.
- McCurry, J. 2006. Ancient art of pearl diving breathes its last: Japanese women who mine seabed one lungful of air at a time are the last of their kind. *The Guardian*. <https://www.theguardian.com/world/2006/aug/24/japan.justinmccurry>.
- Neilson, A. L., Sao, M. R., Sempere, K., Laurinda, S. and Clarisse, C. 2019. A vision at sea: Women in fisheries in the Azores Islands, Portugal. *Maritime Stud.*, 18: 385-397. <https://doi.org/10.1007/s40152-019-00155-0>.
- Ramachandran, C. 2012. A Sea of one's own: A perspective on gendered political ecology in Indian mariculture. 3rd Global Symposium, Gender in Aquaculture and Fisheries. *Asian Fish. Sci., (Special Issue)*: 1-12.
- Stacey, N. E., Gibson, E., Loneragan, N. R., Warren, C., Wiryawan, B., Adhuri, D. and Fitriana, R. 2019. Enhancing coastal livelihoods in Indonesia: An evaluation of recent initiatives on gender, women and sustainable livelihoods in small-scale fisheries. *Maritime Stud.*, 18: 359-371. <https://doi.org/10.1007/s40152-019-00142-5>.
- Immanuel, S. and Sathiadhas, R. 2004. Employment potential of fisherwomen in the collection and post-harvest operations of seaweeds in India. *Seaweed Research and Utilisation*, 26(J&2): 209-215. <http://eprints.cmfri.org.in/5675/>.
- Narayanan, S. 2014. A question of identity.. *Yemaya Newsletter*, 46. International Collective in Support of Fishworkers (ICSF). https://www.icsf.net/wp-content/uploads/2021/06/2069_art_yem46_e_art05.pdf.
- Vipinkumar, V. P., Sahoo, P. K., Srinath Krishna, Ambrose, T. V. and Jiban Dash, S. S. 2013. Gender perspectives and dynamics of bivalve farming Self Help Groups. *Indian J. Fish.*, 60(3), 59-66.
- Vipinkumar, V. P., Shyam, S. S., Johnson, B., Swathilekshmi, P. S., Narayanakumar, R., Aswathy, N., Jephi, A. and Dilip, D. 2017. Is self-help group approach a means for gender mainstreaming? A study on dry fish units in Ramanathapuram District, Tamil Nadu. *J. Indian Fish. Assoc.*, 44(2): 43-52.
- Vipinkumar, V. P., Johnson, B., Swathilekshmi, P. S., Narayanakumar, R., Ramachandran, C., Shyam S. Salim., Reshma Gills, Vidya, R., Athira, P. V. and Dhanya, G. 2020. Mainstreaming gender in the context of seaweed farming SHGs in Ramanathapuram: A pragmatic evaluation. *Indian J. Pure Appl. Biosci.*, 8(4): 294-305.
- Yadav, B. and Sharma, A. 2017. Gender roles analysis of ornamental fish enterprises in Maharashtra state, India, *Asian Fish. Sci.*, 30S: 333-334.