Journal of Coastal Development
ISSN: 1410-5217

Radhika Rajasree SR and S Gayathri, J Coast Dev
2014, 17:1
DOI: 10.4172/ 1410-5217.1000383

Research Article Open Access

Women Enterprising in Seaweed Farming With Special References Fisherwomen Widows in Kanyakumari District Tamilnadu India

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Received date: February 18, 2014; **Accepted date:** April 14, 2014; **Published date:** April 23, 2014

Abstract

Seaweeds are not weeds as the name implies. But they are the renewable marine resources of value, growing well in shallow waters where suitable substratum for its growth exists. They are exploited from the south east coast of Tamil Nadu from Mandapam to Kanyakumari, Gujarat Coast, Lakshadweep islands and the Andaman and Nicobar Islands and few other places like Chilka and Pulicat. Seaweed collection renders extensive employment to the coastal fisher folk. The estimation of seaweed resources indicate that only a negligible quantity is harvested. At present nearly 5000 women depend on the seaweed industries for their livelihood. If the available resources are harvested to its optimal level, it can provide employment to another 20,000 coastal fisher folk in harvesting sector and an equal number in post-harvest activities. Since the domain of seaweed collecting industry is mainly dominated by women, special efforts should be taken for its optimum exploitation and market expansion through diversified product development and their popularization. Seaweed mariculture offers an economically sustainable livelihood option for fisherwomen, who, with little effort can contribute significantly to the household income. Today seaweed cultivation techniques have been standardized, improved and made economically viable. Corporate backed by institutional and financial support led to the expansion of seaweed farming, through Self Help Groups (SHG) model (mostly women). This paper deals with the employment potential of fisher women in seaweed industries and to evaluate the economic performance of seaweed farming, including the empowerment of fisherwomen widows in Muttom, Kanyakumari District of Tamil Nadu, India.

Keywords: Seaweed farming; Employment generation; Financial feasibility; Alternate livelihood

Introduction

Seaweeds or marine macro algae constitute one of the commercially important renewable marine living resources. They are primary producers, shelter, nursery grounds and food sources for marine organisms. Seaweeds are not only of high ecological, but also of great economic importance. Dried thalli are directly used as human and animal food and also as fertilizer. Extracted seaweed substances are used as stabilizers and stiffeners in food industry, cosmetics, pharmaceutical industry, and biotechnology [1,2]. Recent research has pointed to new opportunities, particularly in the field of medicine, associated with bioactive molecules extracted from seaweeds [3,4]. Moreover, due to their habitats and biology, seaweeds are relatively easy to observe, manipulate and measure. Therefore, they have been widely used as model organisms for studying biogeographic patterns and testing various ecological theories, both in intertidal and sub tidal habitats. They are the only source for the production of phytochemicals such as agar, carrageenan and sodium alginate which are widely used as gelling, stabilizing and thickening agents in food, confectionary, pharmaceutical, and dairy, textile, paper, paint and varnish industries.

As many as 1000 varieties of seaweed are in existence in India. Out of which, 300 varieties are in the Gulf of Mannar. The southern coastal region of Tamilnadu was rich in algal flora during early seventies. The region was having more than 200 species of seaweeds. Seaweed cultivation is gaining momentum in Muthiayapuram and the Hare Island in Tuticorin district and Colachel in Kanyakumari district. Thousand families between the coastal area of Mandapam and Rameshwaram have been involved in seaweed cultivation with 20,000 rafts floating in the Palk Bay area. The cost value of seaweed, one tonne of wet seaweed fetches a sum of Rs. 1,750, while dry seaweed is valued at Rs. 14,000.

Commercial harvesting of seaweed from natural sources takes place in the southern portion of the Tamil Nadu coastline, from Kanyakumari (Cape Comorin) in the south, extending northwards to the peninsula that forms the GoM-a total distance of almost 300 km. The commercial harvest of seaweeds in Gulf of Mannar is recommended during the peak growth period of the algae from July/ August to January.

Seaweed farming has been introduced by integrated coastal management projects both to raise the socioeconomic status of coastal communities as well as to provide an alternative income for fisheRs. There is considerable evidence that seaweed farming is a profitable venture for coastal households. India is rich in seaweed biodiversity and has suitable areas for mass cultivation and competitive manpower. Seaweed farming and its related activities have given direct employment to millions of people around the world. A model has been developed and successfully tested where a person can earn Rs. 3000-4000 per month through seaweed cultivation. Seaweed mariculture is a profitable livelihood option for fisherwomen, who can earn a substantial income for the household with little effort.

The fishermen of the coast from Rameswaram to Mundal and of Kanyakumari area get employment in seaweed collection in addition to their normal fishery activities. Later, whenever the conditions are

unfavorable for fishing, they go for collection of seaweeds such as *Gelidiella acerosa* and *Gracilaria edulis*. Each fisherman gets an income of Rs. 30 to 50 per day during the peak season. For the formalin treatment, drying, packing, etc. many persons are engaged as daily wage laboureRs. The wage per day varies from Rs. 10 to 12 for men and Rs. 5 to 8 for women. Approximately 2000 persons get employment during the peak season (August-January).

Study Area

The Kanyakumari the smallest District in Tamil Nadu, with a land spread of 1,684 sq. Km (Lat 8° 12'N; Long 77° 31'E) is located south east coastal region of Tamil Nadu was identified as the target location for studying the structure, conduct and performance of seaweed farming in India in view of its historical background, locational advantages, industry interactions, socio-economic institutional framework and opportunities for expansion and growth (Figure 1). The coastal ecosystem of this District comprises 68 Km in length and is studded with 44 coastal fishing villages. The annual harvest of important species of seaweeds is shown in Table 1.

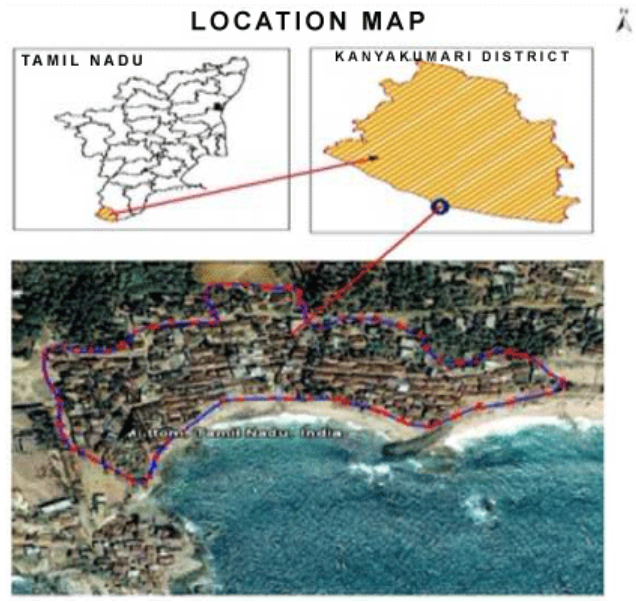

Figure 1: Location Map-Kanyakumari District, Tamilnadu, India.

Seaweeds	Productivity (tonnes)
Gelidiella spp.	74
Gracilaria spp.	974
Hypnea spp.	798
Saragassum & Turbinaria spp.	9381

Table 1: Harvest of Important species of seaweeds.

Seaweed farming in Tamil Nadu

In Tamil Nadu, cultivation of this seaweed started at Mandapam on the south-east coast of India, during 1995–1997. The contract farming method with PepsiCo was successfully implemented in March 2003. Later in the year 2008, Aquagri took over the PepsiCo project. Experience obtained from experimental and field cultivation of *Kappaphycus alvarezii* (Figure 2) in several Indian coastal areas indicates the possibility of large-scale commercial cultivation and a means of additional income generation for the coastal fisherfolk. Commercial cultivation of *K. alvarezii* started in 2003 along the Tamil Nadu coast. At present, *K. alvarezii* production is carried out in five coastal districts of Tamil Nadu namely Ramanathapuram, Pudukottai, Thoothukudi, Thanjavur and Kanyakumari [5].

Figure 2: Kappaphycus alvarezii.

1. *K. alvarezii*-cultivated in the following climatic condition in any area.
2. Seawater Temperature: 30°C ± 3
3. Seawater Salinity: 30 ppt ± 3 ppt is the ideal salinity. But the plant survives upto 30 ppt ± 5ppt.
4. Water Motion: Moderate wave motion.
5. Depth: 1.5 meters with moderate light intensity – good growth [6].

For seaweed farming we have to select the following parameters such as commercially viable Species, Location, and Socio economic status of the growing community and Sound commercially viable technique. As per the "Biological Diversity Act 2002 and Biodiversity rules, 2004", in every local body shall constitute a Biodiversity Management Committee (BMC) with in its area of Jurisdiction". Project implementation and gradual expansion is worked out to one SHG of 5 members as follows. During expansion period of 45 days, farmers will earn Rs. 2500/- per month as a family assistance. (25 days X 100 raft floating)

Seaweed Cultivation at Muttom, Kanyakumari District

Centre for Ocean Research, Sathyabama University have initiated cultivation of *Kappaphycus alvarezii*, by giving rigorous entrepreneurship trainings to fishermen widows by making seaweed as a source of income generation by forming women self-help group at Muttom fishing harbour vicinity, Tamil Nadu (Figure 3). By this, monthly, a woman generates Rs. 8000 by selling the fresh seaweed. At

present, more than 100 trained fisherwomen widows are deploying about 500 rafts made out of bamboo and started harvesting about 15 tonnes of the *Kappaphycus alvarezii* seaweed once in 35 days from sea. Cost and revenue analysis is listed below.

Figure 3: Women involved in seaweed farming in Muttom.

Methods of Cultivation

Along Tamil Nadu coast, floating raft method (Figure 4) was found to be commercially viable method in K. alvarezii farming. In this method seaweeds are cultured at sub-surface level of the sea. Careful selection of seaweed cuttings is important and only healthy and strong branches should be planted. The growing period of the seaweed plant is between 30-35 days.

Figure 4: Floating Rafts.

The raft line needs to be inspected every day. Harvesting of the plant should be done when the individual plant weighs approximately 500 gms (wet algae). The ready to harvest seaweed is brought to ashore and dried for the next two to three days. At the ratio of 1:10, one gets one kg of dried red algae from 10 kg of fresh weight red algae.

Bamboo Raft method

Expenditure for a single raft : Rs. 690

Rafts required for a single person: 45

Members in a SHG : 20

Rafts required for a single group of SHG (45X20): 900

Total expenditure for 900 rafts (900X690): Rs. 6,21,000

Yield

Yield per raft: 260 kg

Seeds stored for the next cultivation from the yield : 60 kg

Quantity of seaweed obtained after drying: 20 kg

Income

Market price for 1 kg of dried seaweed: Rs. 14

20kgXRs. 14X900 rafts: Rs. 2,52,000

Income for a single group: Rs. 1,68,000

Income for a single person: Rs. 8,400

Seaweeds and its employment potential

The commercial exploitation of seaweeds in India has started in 1966. At present the seaweeds are exploited in Gujarat coast and many localities in Tamil Nadu.

The following are the seaweed centers along the southeast coast of Tamil Nadu:

1. Rameswaram
2. Pamban
3. Vedalai
4. Seeniappa Darga
5. Pudumadam
6. Periapattanam
7. Kalimankundu
8. Kilakarai
9. Ervadi
10. Valinokkam
11. Mundal
12. Kanyakumari area

The fishermen of the coast from Rameswaram to Mundal and of Kanyakumari area get employment in seaweed collection in addition to their normal fishery activities. Later, whenever the conditions are unfavorable for fishing, they go for collection of seaweeds such as *Gelidiella acerosa* and *Gracilaria edulis*. Each fisherman gets an income of Rs. 30 to 50 per day during the peak season. For the formalin treatment, drying, packing, etc, many persons are engaged as daily wage laboureRs. The wage per day varies from Rs. 10 to 12 for men and Rs. 5 to 8 for women. Approximately 2000 persons get employment during the peak season (August-January).

The seaweed production potential in India is estimated at 1,005,000 t distributed in six states of India comprising 250,000 t in Gujarat; 250,000 t in Tamilnadu; 100,000 t in Kerala; 100,000 t in Andhra Pradesh; 5,000 t in Maharashtra and 300,000 t in Andaman and Nicobar islands [7]. Rocky and coral formations are found in Tamil Nadu, Gujarat states, and in the vicinities of Bombay, Karawar, Batnagiri, Goa, Vizhinjam, Varkala, Vishakapatnam, and in few other places like Chilka and Pulicat lakes, Andaman and Nicobar Islands. The coastal areas of Tamil Nadu and Grujarat states are the important seaweed growing regions of the country.

Seaweed industry has a potential export market mainly due to its diverse uses. Today, seaweed cultivation techniques have been standardised, improved and made economically viable. Corporates backed by institutional and financial support led to the expansion of seaweed (*Kappaphycus alvarezii)* farming through Self Help Groups (SHG) model (mostly women), starting in a small scale in Ramanathapuram District of Tamilnadu in 2000, which now gradually has spread to neighboring coastal districts like Tuticorin, Pudukottai and Thanjavur [8].

Seaweed mariculture has now become a potential employment generating and income earning activity, which is practiced by more than thousand members of SHGs with the support of private investments, industries, financial institutions like NABARD (through scheduled commercial banks), National Fisheries Development Board (NFDB) and NGOs led by Aquaculture Foundation of India.

The manpower required for fully harvesting the standing crop is considered as the employment potential in this sector. However, the present employment in this sector isles than 10,000 in which more than 50 % are women.

Central Salt and Marine Chemicals Research Institute introduced *Kappaphycus alvarezii*, a seaweed variety, nearly 20 years ago, developed the technology and disseminated to the coastal communities. This is a versatile species and grows fast in open area as well as bays. Kappaphycus seaweed cultivation was demonstrated in several areas of Tamil Nadu coast and in a few places in Gujarat Coast. About 600 families are cultivating this seaweed in Ramanathapuram, Tuticorin, Tirunelveli, Kanayakumari, Pudukottai and Thanjavore districts and each family is earning around Rs. 10,000 a month by spending Rs. 63,000 for making 90 rafts. Due to income potential, in many cases the entire family is becoming actively involved in the cultivation.

Studies conducted by lrulandi and Daniel showed that about 2100 fisher folk were involved in seaweed collection in six villages of Ramanathapuram district. The employment potential for harvesting the standing crop of the country as a whole is worked out as 52,174 persons.

Self Help Group model in *K. alvarezii* cultivation in Tamil Nadu coast

In *K. alvarezii* cultivation, self-help group model promoted by District Rural Development Agency (DRDA), Department of Biotechnology (DBT) and Tamil Nadu State Fisheries Department with the assistance of Non-Governmental Organizations (NGOs) is found to be more effective. A group of five members including men and women is formed, which is called as Joint Liability Group (JLG). Some of the eligibility conditions, which a group has to fulfill, are:

Each member in the group has to undergo three days training programme on seaweed cultivation.

1. Should be Below Poverty Line.
2. Preferably, they should have place near the sea shore.
3. Should not be a defaulter with any financial institution/government.
4. Interest and willingness of the farmer to take up K. alvarezii farming.

The group that fulfills the above conditions is eligible to avail Rs. 1.54 lakhs as loan for 225 rafts (45 rafts per member). Out of this Rs. 1.54 lakhs, Rs. 77,000 is given as subsidy through the concerned promoting agency. Remaining Rs. 77,000 is availed by the members through bank loan at nominal interest, which has to be repaid within three yeaRs.

It has been estimated that India can produce one million tons of dried seaweed and provide employment to 200 thousand families with annual earnings of around Rs. 0.1 million per family. The annual turnover of *Kappaphycus* seaweed farming alone can be safely estimated to be Rs. 2.0 billion [8].

From the year 2003 to 2009, *K. alvarezii* production has shown a steady increase from 147 t to the maximum of 865 t in the year 2009. A decline in production was noted in 2010, which may be due to heavy storm and high temperature. At present, around 1000 to 1200 families are dependent on *K. alvarezii* farming for their livelihood in Tamil Nadu coast. Around 180 and 70 families in *Sambai* and *Mangadu* village respectively in Ramanathapuram District, depend entirely on *K. alvarezii* farming for their livelihood. In these villages there are around 8000 seaweed culture rafts floated in the Palk Bay region [6].

Palk Strait of Ramnad District, Pudukkottai, Tanjore and Tuticorin Districts were surveyed extensively and found suitable for seaweed cultivation. There are 500 Km coastal stretches available with potential of 5000 rafts, which would create an alternative income/ livelihood to 2000 fishers or 100 SHG's (20 members each) of coastal poor with turnover of Rs. 10 to 50 crores per annum [6].

The targeted population focused in the present study was Coastal Fisherfolk (fishermen and women) of Tamilnadu State in the Southern Peninsular India with special reference to Muttom, villages, Kanyakumari District. It has been observed that among captive fishermen, post Tsunami, only 44% of coastal people is fully or partially employed which attributed largely to the communal clashes followed by riots between Srilankan fishermen. This situation calls for a new technology on open sea mariculture to provide continuous jobs in open seaweed farming and post-harvest technology of harvested products. However, there is a substantial gap in the production know how between seaweeds demand and production. Hence, the present work is focused in evolving technologies for the raft culture production and farming of highly priced *K. alvarezii* by supporting coastal folk giving extensive training, demonstration and other necessary technical support to cultivate and post-harvest processing and marketing of the produce to increase the seaweed production and help them earn livelihood. The acceptance of this farming practice by the fishermen widows of Muttom is indicative of the fact that a low cost simple technology, which can provide substantial returns, can find a better adoption among the coastal fisher folk.

Acknowledgement

I express my sincere thanks to Our Honorable Chancellor, Col.Dr. Jeppiaar, Sathyabama University for granting the facilities to carry out the work. Thanks are also given to my fellow researchers Dr. D

Inbakandan, Dr. L Stanley Abraham and Dr. V Ganesh Kumar in helping with the data collection.

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