

SEAWEED CULTIVATION AND UTILIZATION FOR FARMER'S EMPOWERMENT, LIVELIHOOD AND ENTREPRENEURSHIP OPPORTUNITIES: WAY FORWARD

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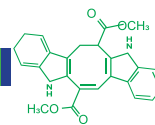
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ABSTRACT

Seaweed farming emerges as a sustainable and diverse means of subsistence for coastal fisherfolk in India, presenting economic opportunities while addressing environmental challenges. This study highlights the importance of seaweed cultivation in Tamil Nadu, India, as a strategic response to climate change and for generating carbon credits. Globally, seaweed output was 35.1 million tonnes, valued at 16.5 billion USD in 2022. In Tamil Nadu, 5,000 families annually harvest 47,000 tonnes of seaweeds, including key species like *Sargassum* and *Turbinaria*. *Kappaphycus alvarezii*, a carrageenan-producing red alga, experienced a peak production of 1,500 tonnes in 2012-13, declining to 400-500 metric tonnes annually. Despite challenges, over 2,000 families engage in seaweed cultivation. The study explores the Bamboo Raft Method, using hollow bamboo poles to construct 12'x12' rafts. Seedlings from robust plants are transplanted onto seaweed-adorned ropes, forming rafts grouped and anchored in shallow water. An optimal configuration involves 400 rafts in a one-hectare area, ensuring effective seawater circulation. This research provides insights into seaweed farming practices and challenges, contributing valuable knowledge for sustainable coastal resource management.

Keywords: Seaweeds, Coastal resources, Seaweed farming, Bamboo raft method



INTRODUCTION

Seaweeds, also known as marine macroalgae, are highly significant coastal resources that hold great value for both people and the environment in numerous nations. Seaweed cultivation is a notable strategy for mitigating the detrimental effects of climate change and can generate carbon credits for our nation (Ross et al. 2015). Seaweed farming is a viable and diverse means of subsistence for coastal fisherfolk in India. The global output of seaweed amounted to 35.1 million tonnes of wet weight, with an expected first sale value of 16.5 billion USD (FAO, 2022). Approximately 47,000 tonnes of seaweed, including species such as *Sargassum*, *Turbinaria*, *Gracilaria*, and *Gelidiella*, are now being harvested from natural seaweed beds in India. This activity is carried out by around 5,000 families residing in Tamil Nadu (FRAD, CMFRI, 2023). *Kappaphycus alvarezii* is being used for seaweed farming in India. This red alga is economically significant as it produces carrageenan, a highly valuable polysaccharide used in several commercial applications (Sudhakar et al. 2021). The cultivation of *Kappaphycus alvarezii* by the fishermen of the Tamil Nadu coast reached its peak production of 1,500 tonnes of dried seaweed in the year 2012-13. Nevertheless, productivity experienced a significant decrease after 2013 as a result of widespread mortality. Approximately 400-500 metric tonnes of dry weight are being generated annually. Over 2000 families engage in seaweed cultivation along the Tamil Nadu coastline.

SEAWEED FARMING

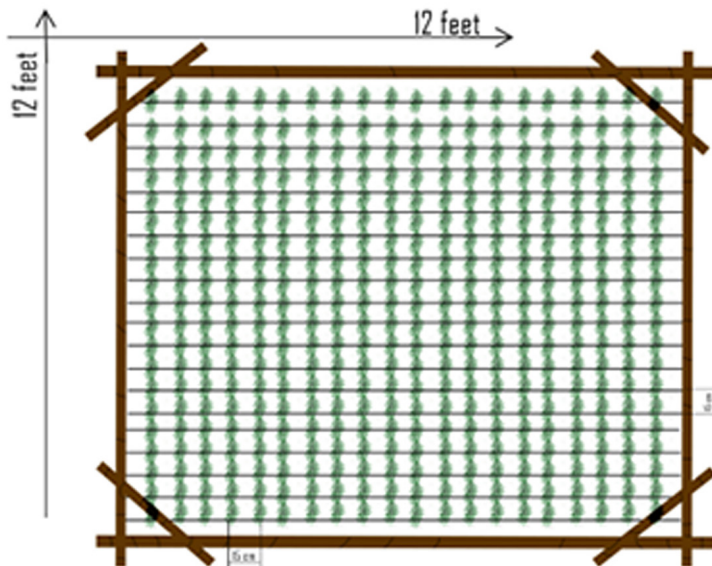
The Tamil Nadu coast of India is primarily embracing the use of bamboo rafts and the monoline technique for seaweed harvesting. The floating bamboo raft method, with bamboo poles of 12 × 12 feet, is particularly well-suited for tranquil and shallow areas. The monoline method of seaweed farming is well-suited for areas with moderate wave activity, shallow depth, and a lower population of herbivorous fishes (Khan, et al. 2023). The tube net technology is being implemented in locations characterized by elevated wave activities.

BAMBOO RAFT METHOD

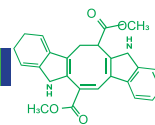
To construct the main structure of dimensions 12'x12' (3.6x3.6 m), it is necessary to choose hollow bamboo poles with a diameter of 3-4 inches. These poles should be free from any natural holes, cracks, or other imperfections. Additionally, for the diagonals, bamboo poles with a diameter of 4'x4' (1.2x1.2 m) should be used. The poles should be securely fastened together using a 4 mm rope (Sobuj et al. 2023). To create ropes for planting in plantations, one can cut either 3 mm or 3.5 mm polypropylene twisted rope into 20 segments, each measuring 4.0 - 4.5 m in length. By dividing the lengthy HDPE braider into 20 parts, each with a length of 25 cm, a total of 400 pieces may be obtained (Bhushan et al. 2023). These pieces can then



be used to create 20 plantation ropes. The task involves twining 20 braiders onto a 4.5 m long polypropylene twisted plantation rope. The braiders should be spaced at 15 cm intervals, with 0.5 m of rope left on either side for tying onto the pole. Seedlings should be obtained from robust plants, ideally from the young section of the plant with more apical sections. To ensure the successful transplantation of seedlings from different districts or states, it is advisable to place them in a pristine mesh bag and submerge them at a depth of 1-2 meters in the sea for a few days before planting. Seed material should be stored in sheltered regions, away from direct sunshine, rain, and fluctuations in temperature and humidity. This would have a significant impact on the quality of the seed material. The rope is adorned with around 150 – 200 grams of fragmented seaweed, with each fragment spaced 15 cm apart throughout the length of the rope. A collective of 20 individual pieces of seaweed are fastened together using a single rope, and a total of 20 of these ropes are then fastened together to form a raft. This raft requires a quantity of seeds ranging from 60 to 80 kilograms. A group of five rafts connected by a 6mm rope. A group of five rafts are arranged in the shallow water region with a depth ranging from 1.0 to 1.5 meters. They are secured in place using a 30-kilogram anchor attached to a rope with a diameter of 12-14 mm. An optimal seaweed farming configuration involves placing 400 rafts, each measuring 12 × 12 feet, in a one-hectare area (Sarkar et al.2021). This guarantees enough distance between the rafts to facilitate effective seawater circulation, maintenance, and other agricultural activities (Fig. 1 & 2).



Diagrammatic view of Bamboo raft method



Bamboo raft method of seaweed farming

CONCLUSION

Seaweed farming has emerged as a sustainable and diverse means of subsistence for coastal fisherfolk in India, offering economic opportunities while addressing environmental challenges. This study underscores the importance of seaweed cultivation in Tamil Nadu as a strategic response to climate change and a potential source of carbon credits. The global seaweed output, valued at 16.5 billion USD in 2022, emphasizes the economic significance of this industry.

Despite challenges, including a decline in the production of *Kappaphycus alvarezii* after its peak in 2012-13, over 2,000 families in Tamil Nadu continue to engage in seaweed cultivation. The Bamboo Raft Method, utilizing hollow bamboo poles and polypropylene twisted ropes, has become a prominent technique, contributing to the success of seaweed farming. This method, along with the monoline technique and tube net technology, caters to various environmental conditions, making seaweed cultivation adaptable and resilient. As demonstrated by the optimal configuration involving 400 rafts in a one-hectare area, the study provides valuable insights into seaweed farming practices. It highlights the importance of effective seawater circulation, maintenance, and suitable agricultural activities for successful cultivation. This research contributes to the knowledge base for sustainable coastal resource



management, emphasizing the potential of seaweed farming as a model for balancing economic development and environmental stewardship in coastal regions.



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