



CURRENT STATUS AND UNTAPPED POTENTIAL OF SEAWEED FARMING IN INDIA

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INTRODUCTION:

Seaweed, a marine macroalga, is a highly versatile resource with applications in food, pharmaceuticals, cosmetics, biofuels, agriculture, and environmental restoration. Globally, seaweed farming is one of the fastest-growing sectors of aquaculture, with over 35 million tonnes produced annually. Seaweeds play a pivotal role in carbon sequestration, nutrient cycling, and enhancing marine biodiversity.

India, with its 7,500 km-long coastline, abundant Exclusive Economic Zone (EEZ), and favorable climatic conditions, holds immense potential for seaweed farming. However, despite these advantages, the country's seaweed production remains relatively small, limited to traditional harvesting and small-scale farming. Recent government initiatives under the Blue Economy Vision 2030 and the Pradhan Mantri Matsya Sampada Yojana (PMMSY) have identified seaweed farming as a priority sector, paving the way for its expansion.



CURRENT STATUS OF SEAWEED FARMING IN INDIA:

India is home to over 700 species of seaweed, with an annual harvestable biomass of 0.26 million tonnes. However, much of this comes from wild harvesting, primarily concentrated in Tamil Nadu, Gujarat, and Maharashtra. Approximately 52,000 tonnes (wet weight) of seaweed are harvested annually, involving around 5,000 families in Tamil Nadu alone.

The cultivation of high-value species such as *Kappaphycus alvarezii* (used in carrageenan production) and *Gracilaria* (for agar) has gained traction in recent years. Yet, large-scale farming remains limited due to infrastructural, logistical, and policy challenges.

The ICAR-Central Marine Fisheries Research Institute (CMFRI) has made significant

strides in identifying suitable farming areas. Through coastal surveys and remote sensing, the institute has mapped 24,252 hectares of potential seaweed farming zones across 333 locations within 1 km of the low-tide line. These areas are estimated to have an annual production potential of 10 million tonnes (wet weight).

Trial farming is being conducted at 78 of these sites, demonstrating the feasibility of large-scale seaweed cultivation. Despite this progress, India's overall contribution to the global seaweed market remains underwhelming, accounting for less than 1% of global production.



UNTAPPED POTENTIAL OF SEAWEED FARMING IN INDIA:

India's untapped potential in seaweed farming is immense, given the favorable geographical, environmental, and socio-economic conditions:



- **Scaling Commercial Production-**

The ICAR-CMFRI estimates that the identified farming zones alone could produce nearly 10 million tonnes of seaweed annually. Expanding commercial cultivation, particularly of high-value species like *Gracilaria*, *Sargassum*, and *Kappaphycus alvarezii*, could significantly boost production and export potential.

- **Emerging Applications-**

1. **Biofuels:** Seaweed is a promising feedstock for bioethanol and biogas production, offering a sustainable alternative to fossil fuels.
2. **Bioplastics:** Seaweed-based biodegradable plastics can address the growing demand for eco-friendly packaging solutions.
3. **Nutraceuticals:** The rich bioactive compounds in seaweed have applications in functional foods and dietary supplements.

- **Socio-Economic Impact-**

Seaweed farming has the potential to transform the livelihoods of coastal

communities, especially women and economically disadvantaged groups. The labor-intensive nature of the industry creates employment opportunities while requiring minimal capital investment. Under PMMSY, it is projected that seaweed farming could provide direct and indirect employment to 0.5 million people during its initial stages.

- Moreover, the short cultivation cycle of seaweed (6–8 weeks) enables multiple harvests annually, ensuring consistent income for farmers. Women-led cooperatives and small-scale enterprises are particularly well-suited to benefit from this sector.

Government Initiatives and Policy Support:

The Pradhan Mantri Matsya Sampada Yojana (PMMSY) is the flagship program driving the development of seaweed farming in India. With a budget allocation of ₹640 crores, the initiative aims to:

1. Increase seaweed production to 1.12 million tonnes (wet weight) within five years.
2. Establish tissue culture laboratories, nurseries, seed banks, and processing units.
3. Provide financial assistance, technical training, and marketing support to fisherfolk, particularly women-led households.

In addition to PMMSY, regional governments in Tamil Nadu, Gujarat, and Andhra Pradesh are actively promoting seaweed farming through subsidies and skill development programs.



Challenges in Seaweed Farming:

Despite its potential, the seaweed farming sector in India faces several challenges:

1. Infrastructure and Logistics-

- Lack of adequate facilities for seed cultivation, processing, and storage hampers large-scale production.
- Limited cold-chain infrastructure affects the quality of harvested seaweed, reducing its market value.

2. Policy and Regulatory Gaps-

- Ambiguity in coastal regulations and overlapping jurisdiction among fisheries, agriculture, and environment departments create hurdles for new entrants.
- Export policies for seaweed and related products require clearer guidelines to enhance market access.

3. Environmental Risks-

- Climate variability, including temperature fluctuations and ocean acidification, poses risks to seaweed growth and productivity.
- Pests and diseases, such as epiphyte infestations, can affect yields.

4. Limited Awareness and R&D-

- Many coastal communities remain unaware of the economic opportunities offered by seaweed farming.
- Research on high-yield, disease-resistant seaweed varieties and cost-effective farming techniques is still in its early stages.



Future Strategies for Growth:

To realize the full potential of seaweed farming, India must adopt a multi-faceted approach:

1. Research and Development-

Investing in biotechnology and breeding programs to develop resilient seaweed strains is critical. Establishing collaborations between academic institutions, government bodies, and private enterprises can accelerate innovation.



2. Infrastructure Development-

Building state-of-the-art processing units, tissue culture labs, and cold storage facilities will enhance the quality and value of seaweed products.

3. Market Expansion-

Developing domestic markets for seaweed-based products, such as biofertilizers, nutraceuticals, and bioplastics, can reduce reliance on exports. Public-private partnerships (PPPs) can play a key role in market development and distribution.

4. Policy Reforms-

Streamlining coastal regulations and introducing farmer-friendly policies will encourage new investments. Export promotion schemes and financial incentives can further enhance India's competitiveness in the global seaweed market.

CONCLUSION

Seaweed farming in India represents a unique opportunity to combine economic development with environmental sustainability. With strategic investments, supportive policies, and technological advancements, India can emerge as a global leader in seaweed cultivation and processing. By addressing the existing challenges, the country can unlock the full potential of this sector, transforming the livelihoods of coastal communities and contributing to the global fight against climate change.

