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# 3D Ocean Farming - A Key to Challenge Global Food Security and Environment Sustainability

**Abhishek Chaudhary**

SRM College of Agricultural Sciences, SRM Institute of Science and Technology, Vendhar Nagar, Baburayanpettai, Chengalpattu, Tamil Nadu, India.

Corresponding author's e-mail: *chaudharyabhishek979@gmail.com*

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## ABSTRACT

**Seaweeds are the essential component of marine ecosystem which are rich source of protein and other nutrients along with its bioremediation activity to clean the polluted marine ecosystem. 3D Ocean farming is an Integrated Multi-Tropic Agriculture (IMTA) which seeks production of sea weeds, shellfish, mussels, clam, oysters, sea vegetables and so on. It provides maximum output with minimum investment and can be a life changing farming idea to marine farmers and fishermen to transform their income and life to a better and sustainable future. This regenerative farming can give abundant production with minimum investment and maintains clean marine ecosystem by absorbing the heavy metals, carbon, nitrogen leading to sustainable agriculture practices.**

## INTRODUCTION

Rising global temperature, rising pollution, and rising food demand due to rise in population have created a huge impact on ocean ecosystem. The oceans are polluted and the ecosystem is degrading day by day leading to decrease in millions of life species. To face this global challenge a huge potential is buried beneath the depths of our oceans. A revolutionary concept has emerged in search of sustainable alternatives to food and fuel: 3D farming by Bren Smith

(Company: GreenWave). This revolutionary farming has the potential to provide food and fuel to the increasing population and also provides a foundation for biodiversity to bloom.

## THE ROLE OF SEAWEEDS IN MARINE COASTAL ECOSYSTEMS

Seaweeds are the scenic components of coastal landscapes which plays a critical role in marine ecosystem. They are essential bioresource with numerous functions. They are present in the marine ecosystem to sustain the other life sources. Marine seaweed species are still acknowledged as underutilized resources which serves as a source of food and industrial raw materials along with its use in cosmetic, medicinal, therapeutic and botanical applications. It can also be used as animal nutrition, fodder supplements and its productivity. Apart from food and fuel, Seaweeds absorbs the carbon dioxide from the water which protects the shelled organisms from ocean acidification. Some seaweeds show the remarkable ability to purify water by removing heavy metals which makes them valuable in bioremediation efforts, particularly for combating excess carbon and nitrogen pollutants.

## 3D OCEAN FARMING: A REGENERATIVE SOLUTION

3D Ocean farming is a regenerative cultivation of seaweeds along with other marine species such as oysters, oysters and scallops. This regenerative 3D model of farming not only provide us with feed and fuel but also helps in restoration and regeneration of marine ecosystem. It is one of the sustainable approaches to create a symbiotic system where different species of organisms can co-exist and can create a balance in the ecosystem. This 3D model of the farming can be an innovative way to clean the ocean along with the provision of food and fuel leading to sustainable agriculture.

## MINIMAL INVESTMENT, MAXIMUM IMPACT

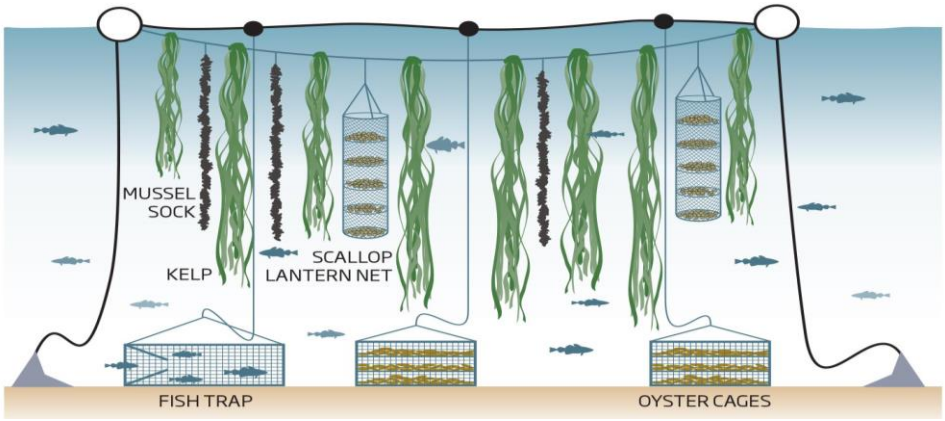
3D Ocean farming has the minimal investment unlike other farming which makes it more profitable and appealing to the farmers. There is no application of fertilizers, pesticides, fungicides, boosters or any other external sources except for the structure and seeding materials. The cultivation model is based on the vertical farming which consists of horizontal ropes on the surface of water and is anchored to hurricane-proof floats. These ropes are connected to the lines under the water which supports seaweeds along with the hanging net interspersed throughout the system to facilitate the growth of mussels and scallops. Clam and oyster cages are also connected to the surface structure resting on the sea bed creating a harmonious ecosystem. Pearls can be another source of income which can generate a huge revenue by planting the pearls seeds in the mussels, clams and oysters and can give the best quality in the natural ecosystem. According to Bren Smith, an acre of 3D farm has the potential to produce 5,000,000 shellfish and 20 tons of sea vegetables per year with almost zero inputs.

## NUTRIENT-RICH SEAWEEDS: A KEY TO SUSTAINABLE AGRICULTURE

Seaweed has abundant nutrient profile which consists of vitamins, antioxidants, minerals, vitamins, amino acids, antibiotics and other beneficial nutrients. The protein content ranges from 10%-30% of its dry weight depending upon the type of seaweed (Pereira, L. et al., 2024). Introducing seaweeds into our diet can meet out the protein and several other nutrient requirements along with numerous health benefits. Beside these health benefits, seaweed

polymers such as alginates, agars, phlorotannin, etc. exhibits diverse biological activities in both animals and plants which ultimately promotes plant growth and helps in host defence mechanisms.

**3D Ocean Farming as Integrated Multi-Tropic Agriculture (IMTA):**




(Source: https://www.newscientist.com/article/mg23431230-900-fish-extinctions-not-if-i-can-kelp-it/)

3D Ocean farming is based on the principle of Integrated Multi-tropic Agriculture which includes cultivation of different species together in the same environment resembling a natural biodiversity with a balanced ecosystem. The marine organisms are naturally originated to interact with each other where seaweeds, kelp, shellfish, and other marine species interact in a mutually beneficial way. Due to their mutual interaction creates a self -sustaining environment for their growth.

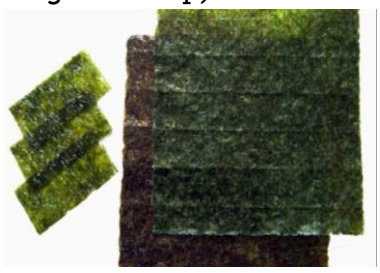
Seaweeds

Kelp

Oysters

(Source:https://wikifarmer.com/seaweed-in-agriculture-how-can-we-use-it/, https://en.wikipedia.org/wiki/Kelp)

Mussels



Processed seaweeds

(Source:https://asc-aqua.org/learn-about-seafood-farming/farmed-mussels/, https://en.wikipedia.org/wiki/Nori)

As ocean itself is a vast and immensurable source of nutrients and life supporting elements for marine organisms, there is no need of external input for the farmers to provide the crops in this system of farming which ultimately generates a transformative source of income to the ocean farmers and fishermen.

## ENVIRONMENTAL HEALING AND BIOREMEDIATION

Anthropogenic wastes from the industries are mostly left untreated which contains contaminants like heavy metals, nitrogenous compounds, pesticide residues, phosphorous compounds, hydrocarbons, dyes, etc. Seaweeds are known for controlling eutrophication, improving the quality of water by purification. They have the potential to absorb heavy metals(bioremediation) from the water (Rehana Raj et al.,2022). This farming model is cleaning the marine pollution and leading the ocean to sustainable and balanced ecosystem. The population of coral reefs has been decreasing day by day which has created an unbalance marine ecosystem due to marine pollution and be restore through this model of farming. This farming model can be best for healing the current situation of the marine ecosystem along with other bioremediation methods.

## CONCLUSION

3D ocean farming can become a transformative source of income and a way of living for the marine farmers and fishermen with minimal investment. With increasing demand of vegan protein and seaweeds in several countries like Japan, Korea, Thailand, etc. have opened a wide market place for the farmers to generate income. This regenerative model of ocean farming has the potential to meet the food demand along with healing of marine ecosystem. This sustainable farming can become the game changer in future to meet the daily nutrient demand of humans along with bioremediation of marine water.

## REFERENCES

Pereira, L.; Cotas, J.; Gonçalves, A.M. 2024. Seaweed Proteins: A Step towards Sustainability? Nutrients 16: 1123.

Rehana Raj, Manju N.K., Fazil T.S., Niladri Sekhar Chatterji, R. Anandan and Suseela Mathew. 2022. Seaweed and its Role in Bioremediation - A Review. Fishery technology 59: 147-153.