APY ANALYSIS FOR SHRIMPS AND SEAWEEDS FARMING

The goal of the study is to conduct Area, Production, and Yield (APY) analysis, in a way never done before, and bring out the uniqueness of the study.

The findings brought out the key stakeholders of the Underwater Domain Awareness (UDA) framework. Assisting these stakeholders, namely science and technology, the blue economy, the marine environment, and disaster management, subsequent progress in APY analysis and focussing on the shortcomings and potholes can help in determining a *sustainable route* for the growth of aquaculture in the Indian Ocean region (IOR).

The study accentuates the environmental impacts study of shrimp and seaweed aquaculture and shows up the vast disparities between the two. *Shrimps farming clearly showed some negative impacts while the current research on seaweed and their cultivation has shown them to be highly sustainable. They lie on the two ends of the sustainability spectrum*. The following points support the argument:

Negative Impact of shrimp aquaculture	Positive Impact of seaweeds Aquaculture
1. Excessive water and land usage 2. Significant natural habitat loss 3. Saltwater intrusion to the soil causing depletion in-ground freshwater table 4. Danger to the socio-economic development 5. Freshwater scarcity 6. Loss of cultivating land for staple foods 7. Toxins contained pond effluents 8. Mangroves and salt marshes' destruction 9. Coastal biodiversity loss 10. Higher machinery required for pond preparation - Electricity consumptions	1. Carbon absorbers. 2. Oxygen generators 3. Ecosystem engineers 4. Biofuel production - Source of renewable energy 5. Bioplastic manufacture 6. Nutritious Source - traps essential amino acids supporting various life forms 7. Cattle feed - rich manure 8. Fertiliser substitute 9. Value-added products - pharmaceuticals, agar, alginate, carrageenan, etc 10. Wastewater Treatment - accumulates toxic compounds

Working on the APY Tool

Development of APY tools to aid in the conventional APY analysis of shrimps and seaweeds is becoming increasingly important as the technology can provide real-time data for the analysis. The designed APY compute tool is intended to give two distinct features that are Available Data and Parameter Based Analysis.

This analysis should encompass two broad areas, first is the Growth Patterns in Area, Yield, and Production, *which is required for the assessment of instability and risk by highlighting regions with negative growth patterns or high variability in production*, and the *second is the Yield parameter relationship, which entails the establishment and verification of relationship relating the obtained Yield with the parameters affecting the yield*.

While the tool has subtle technicalities, it helps us to acquire the estimated results about the production and yield. The model for APY analysis can be seen as a mapper or function, which maps the input parameters to the output yield.

Selection of the species and Identification of environmental factors

The extensively grown shrimp species in the Indian Ocean region include *L.Vannamei* and *P.monodon*, and seaweeds, including *Kappaphycus alvarezii* and *Gracilaria edulis*. The following table tabulates environmental factors affecting the growth of the organism.

Shrimps	Seaweed
1. Temperature 2. Stocking Density 3. Water Quality 4. Dissolved oxygen level 5. Feed Conversion Ratio 6. Soil Quality 7. Feed Quality	1. Temperature 2. Light Intensity and Effect of UV rays 3. Water Salinity, Nutrient content 4. Water motion 5. Stocking Density 6. Water level Depth and clarity 7. Skill Assistance

Important observations and conclusions

Shrimps

• Growth virtually stops below 18 degrees Celsius and is optimal around 30 degrees C
• Lower stocking density favors the growth of the shrimps
• The salinity of brackish waters is preferable for the shrimp's growth
• The optimal pH is slightly above neutral and lies in the range of 8.0 to 9.0 pH
• Higher DO levels are required for the survival of the shrimps

Seaweed

• Temperature of the IOR and water with higher salinity is suitable for higher growth.
• Higher stocking density upsets the organism
• The adequate presence of sunlight is a life governing condition
• With higher turbidity, the attenuation of the light wave in the water also increases
• Lower solar irradiance inhibits photosynthesis, diminishes the growth rate
• Very high exposure to light causes the thallus tissue loss

Feasibility of research and Implications of IOR shrimp production data

•Various technologies have emerged to equip us with sensors capable of collecting real-time valuable data about farms. E.g. Sensor RS-PH–2- is used to measure PH value.

• The majority of the states had a growth rate of around 150 percent, indicating promising opportunities associated with the commercial value of the L. vannamei species. In contrast, tiger shrimp output has declined during the last decade. No structured data about wild shrimp scampi is available.
• Because of the large number of missing values and unstructured data, we are unable to assess the clear variations in area and also the variance values are very high because of such missing values.

- **The completion of the research brought out the following associated opportunities and limitations in this area:**

Opportunities

● Blue Economy models assist us in shifting resources from scarcity to plenty and to begin addressing issues that contribute to environmental difficulties.
● The rapid development of India's blue economy and use of its maritime resources is a critical component of the country's energy self-reliance
● India is geographically located. As a result, it has considerable aquaculture potential.
● Work also has a digital presence & thus has the scope of advanced research to be built upon the tool. Machine learning models can be useful for prediction applications such as biomass information assessment and prediction of water quality indicators.

Limitations

● Data sets tabulating real-time environmental factors to be made available for research
● Efforts should be made to perform thorough on-site research to ensure the long-term viability of any aquaculture project.
● Farmers should be made more aware of technology to make the whole project a practical success.
● To examine real-time water quality indicators as well as information impacting aquaculture species and biomass, an accurate framework is necessary.