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A Review on Seaweed as a Renewable Energy Source and Future Crop for Combating Climate Change

Amir Aiman Mohd Radzi[a], Judith Gisip[b*]

Structured Abstract

Background: Seaweed, or marine macroalgae, is gaining significant interest as an alternative solution for addressing climate change due to its impressive capability to capture and store carbon dioxide, as well as its potential as a sustainable energy source. Given the present worldwide emphasis on reducing greenhouse gas emissions and shifting towards sustainable energy sources, seaweed emerges as an outstanding option for tackling these crucial issues. Seaweed, being a highly efficient and rapidly growing organism, can serve as a valuable source of biofuel and biomaterials while also playing a vital role in lowering the impact of carbon dioxide emissions on the environment. This highlights the immediate urgency to look into and harness the vast value of seaweed as a sustainable and environmentally friendly resource for the future.

Literature Review: This study provides a comprehensive review of seaweed, classified according to pigments as brown, red, and green varieties, which play an essential part in mitigating climate change by sequestering carbon, serving as a reservoir for carbon, and contributing to the reduction of atmospheric CO2. It benefits in mitigating ocean acidification and supporting the restoration of marine biodiversity. Seaweed farming is a rapidly growing industry worldwide. It involves many techniques such as raft and long-line farming and is included in multi-trophic aquacultural systems ensuring environmental sustainability. Besides, seaweed can be a potential bioenergy output, especially biofuels. Its energy conversion may be an important renewable resource in the sustainable energy landscape despite process cost-effectiveness and technical challenges.

Conclusion: As a sustainable agricultural commodity and promising renewable energy supply, seaweed offers a unique environmental response. With its great carbon sequestration, it can mitigate climate change by lowering atmospheric CO2 and ocean acidification. Seaweed can be cultivated with raft, long-line, and Integrated Multi-Trophic Aquaculture, making it an eco-friendly crop that can coexist with marine life and increase biodiversity. Seaweed biomass may be converted into biofuels, offering a sustainable alternative to fossil fuels. Large-scale seaweed cultivation could improve energy and food systems worldwide. Even if cultivation and bioenergy conversion are difficult, continued research and development could make seaweed the foundation of a sustainable and low-carbon future.

Keywords: Climate Change Mitigation, Carbon Sequestration, Renewable Bioenergy, Seaweed Aquaculture, Sustainable Agriculture

*Correspondence: judith@uitm.edu.my

[a] School of Biology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia

[b] School of Industrial Technology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia