Journal of Fundamentals of Renewable Energy and Applications

OPEN ACCESS Freely available online

Perspective

Challenges of Algae Fuels as Biofuels and their Applications in the Environmental Economy

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ABOUT THE STUDY

Algae fuel, algal biofuel, or algal oil is a liquid fossil fuel substitute that exploits algae as a source of energy-rich oils. Furthermore, algae fuels are a viable alternative to well-known biofuel sources such as maize and sugarcane. It is known as seaweed fuel or seaweed oil when manufactured from seaweed (macroalgae).

Algae biofuels have the potential to be a competitive alternative to fossil fuels; nevertheless, this technology must overcome a number of challenges before it can compete in the fuel market and be widely deployed. These problems include strain identification and improvement in terms of both oil productivity and crop protection, nutrient and resource allocation and utilization, and the creation of co-products to improve the overall system's economics. Although there is a lot of excitement about the possibilities of algal biofuels, there is still a lot of work to be done in the industry. We seek in this article to highlight the major challenges to economic algal biofuels at scale, as well as to increase the scientific community's attention on addressing these challenges and moving algal biofuels from promise to reality.

The world economy depends on fossil hydrocarbons to function, from the production of plastics and fertilizers to the provision of electricity for lighting, heating, and transportation. With our growing population and developing economy, we will require more fossil fuels. Data indicate that when countries grow their GDP per capita, their demand of fossil fuels will increase, as will competition for these finite resources. Furthermore, there is an increase in atmospheric CO_2 concentration, as well as the possibility of considerable greenhouse gas-mediated climate change, which now appears to influence all portions of the planet. Finally, petroleum, which is generated in part from ancient algal deposits, is a finite resource that will run out or become prohibitively expensive to extract.

These forces are driving the development of renewable energy sources that can replace fossil fuels, provide wider access to fuel supplies for all nations, and significantly reduce carbon emissions into the atmosphere. A variety of technologies have been investigated as renewable energy sources, and while no single technique is likely to provide a complete solution, it appears plausible that a combination of tactics might be used to significantly reduce our reliance on fossil fuels. The issue now is to create renewable energy sectors that are both sustainable and cost competitive with existing energy options.

When its plant matter base (biomass) is grown, biofuel absorbs carbon dioxide from the atmosphere. When the fuel is burned, the carbon dioxide is released back into the atmosphere. The burning of fuel and diesel produces a wide range of local air pollutants. Bio-based fuels are expected to produce an estimated 80% decrease in overall CO_2 emissions throughout their life cycle when compared to fossil fuels. Producing biofuels reduces reliance on conventional fossil fuels and increases fuel supply diversification. Sustainable biofuel is an appealing alternative to fossil fuel since it is not limited to areas where fossil fuels may be drilled, allowing for an expanded geographic supply.

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Received: 02-Jan-2023, Manuscript No. JFRA-23-23366; **Editor assigned:** 06-Jan-2023, Pre QC-No. JFRA-23-23366 (PQ); **Reviewed:** 27-Jan-2023, QC No. JFRA-23-23366; **Revised:** 03-Feb-2023, Manuscript No. JFRA-23-23366 (R); **Published:** 10-Feb-2023, DOI: 10.35248/2090-4541.23.13.306

Citation: John W (2023) Challenges of Algae Fuels as Biofuels and their Applications in the Environmental Economy. J Fundam Renewable Energy Appl. 13:306.