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Will Bio-Fuel be Environmentally Friendly and Sustainable Fuel of the Future?

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Fossil fuel dependency in each area of production, transportation, agricultural and service sector has become energy intensive. The increased demand for energy, climate change, and energy security concerns have led to the recent interest in alternative and renewable energy. Because of two major constraints such as environmental impact of using fossil fuels, particularly climate change, and due to depletion of the reserves of fossil fuels the present energy consumption system cannot be sustained. The percentage share of traditional fuels in many developing countries has been falling in recent years mainly due to rapid increase in commercial energy consumption [1-3].

Approximately 150 billion tonnes (Bt) of biomass (100 Bt of organic dry matter of land biomass and 50 Bt of aquatic biomass), which is an important non-fossil resource of energy with low carbon foot print because plants use up carbon dioxide (CO_2) in photosynthesis, are produced annually. Plant biomass can be converted into biofuels and has the potential to provide approximately 14% of the total world's energy demand [2]. Utilization of biomass based renewable energy can be one of the most effective approaches to the mitigation of green house gases (GHG) emission and would be reducing consumption of these fuels through their substitution by renewable fuel. Biofuels can be transported and stored, and can be converted to heat and power on demand, which is essential in an energy mix with a high dependence on intermittent sources [4].

21st century is an appropriate era to build a positive climate of alliance between different industrial, academic and socio-economic groups working in different fields; within the energy delivering and utilizing in relation to the disciplines of ecological economics, material and energy flow accounting, multi-criteria analysis, water issues, public perception of risk, and land use assessment in a broader prospect for proper enactment. Societal metabolism also plays an important role to link between energy consumption, economic development and its consequences towards environment. Looking into the carbon footprint between energy, economic head and financial crisis that started during 2008 has been incessantly worsening with growing public awareness of environmental complications like global warming, climate change, loss of habitats, energy crop production, biodiversity, urbanization, water purification and the generation of energy statistics by national and international bodies; to close become a broiling topic to be solved and not to be scared for the addiction towards fossil fuel [2-5]. Analyzing the viability of each sector of renewable energy ground the energy return on energy invested and the net energy endowment for the rest of the society a quite optimistic option using the life cycle assessment, undertake the CO_2 emissions derived from bioenergy taking the advantage of its profusions, practicality, leaving wind and solar in expensive, many can manage the energy crops, energy forestry, challenging it is expected to be one of the key imminent energy sources both in developed and developing countries [5,6]. For all these reasons it is extremely demanding to visualize the best possible outcome by the development of renewable energy sources; a fact which makes it complicated to obtain large investments in this field.

Depending on the feedstock choice the second-generation biofuel production has the potential to provide benefits such as consuming waste residues and making use of abandoned land. Lignin content of lignocellulosic biomass mainly acts as adhesive or binder in wood that provides strength and structure to the cellular composites of the plant and protects against microorganism or chemical attack [7-9]. Algal biomass, being a high protein biomass, nitrogen content of microalgae which varies between 2-15 wt% is matter of great concern due to nitrogen oxide emission if used as fuel. While the percentages vary with the type of algae, there are algae types that are comprised up to 40 wt% of lipids on dry basis. What really makes algal biomass feasible for biofuels production is the fact that many forms of algae have very high hydrocarbon contents. Also, this material provides a high-value co-product that offsets the cost of converting the algae to fuels. Growing microalgae also removes nitrogen and phosphorus from water and consumes atmospheric carbon dioxide. Moreover these Algae can capture CO_2 from coal, gas, or petroleum-fired electric utilities, allowing recycling or sequestration of emissions, especially if the algal residues are rendered refractory for long periods of time.

The real justice towards sustainability with essentially improved economic growth is possible only by implementing the value-added standard of living without disproportionate environmental degradation or social injustice. In a glimpse practice of each biogenic waste like biomass, by evading proposed terms like de-growth, downsizing, always retains a safe place with a sustainability revolution which should start with a shift towards the cognizance [9-13]. In order to make biofuels cost competitive, it is important to develop processes for the 100% utilization of biomass components. There are several competing pathways such as fermentation, gasification, and pyrolysis for converting the biomass to liquid fuel, chemicals, and/or hydrogen. Due to the inherently high moisture content of biomass and microalgae, there is substantial energy needed to dry the biomass before it can be used for biofuels production. The application of sub- and supercritical water technology can be a viable option. The technology is based upon the use of water as reactant and reaction medium for the chemical reaction [11]. For example supercritical water and pyrolysis based technologies can be applied in the processing of nontraditional biomass and microalgae, either whole or its oil extract, with similar yields and efficiencies at a level that can be scaled to commercial production. For conversion of biomass into transportation fuels, two key molecular

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transformations are needed: (a) depolymerization, and (b) removal of oxygen. By dehydroxylation, the hydrogen content along with oxygen content of the biocrude can be reduced, which in turn causes biocrude to rapidly convert into solid biochar. The challenge involves developing a process that can tolerate the complex compositions found with different biomass [2,11].

Discussing above outcomes with the lack of effective conceptual frameworks making it a bit possible for every society to address the problems associated with a new "energy reality" to be faced in this millennium. To think and find the sustainable society avoiding oil crisis with global warming all real intellectuals those dealing with phenomena associated with complex dynamics it is necessary to adopt universal translucent visions, complex assessment procedures and flexible policy tools [1,9].

Development of biomass based energy systems is at a relatively new. The research and development efforts are needed to increase biomass production and conversion particularly in the demonstration of promising systems. A change in attitudes is also required, whereby biomass is no longer neglected in policy making, and models. Most of the developing economies are on an aggressive race towards massive industrialization is watched by large population growth, shortage of conventional resources at world level with most alarming situation of ecological challenge. Further to imagine that all developing nation will choose an environmentally friendly path while relatively cheap fossil fuel addiction is still ongoing in global race seems pretty difficult. All the renewable energy utilization effort should be aimed not only at finding amended analytical tools for studying and covering our sustainability dilemma, but also at establishing a new workable platform to access in our society and new generation to overcome. Thus there is a need to identify and evaluate paths by which plant biomass can make a large contribution to meeting future energy demand. Finally the jeopardy outcome pronounced with optimistic challenges to be faced and implemented all over the globe for the efficient utilization of biomass derived fuel.

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