



Bio-Energy for Environmental Sustainability

Summary

Alternative energy resources are sources of energy other than fossil fuels which include all renewable energy sources. They are often referred to as green energy or clean energy and are highly beneficial and sustainable to the environment. Some of these alternative sources are solar energy, wind energy, bioenergy which includes biomass and biofuels.

This article reviews probable alternative resources, importance and sustainability issues.

Introduction:

Energy and environment are vital elements for sustainable development. They shape our daily life and development. The widely used fossil fuels energy as primary sources of energy has shown its gradual propensity for depletion along with the formation of various harmful greenhouse gases and overall environmental hazards. This has necessitated the need for efficient energy utilization and access to innovative alternative energy resources.

I. Bio-Energy

Bio-Energy is one of the alternative resources abundantly available to meet our energy demands. It is a form of renewable energy that is derived from living organic materials known as Biomass which can be used to produce fuel for transportation, energy, heat, electricity and other product.

II. Bio-Mass

Biomass refers to all organic matter existing in the biosphere, whether of plant or animal origin, as well as those materials obtained through their natural or artificial transformation [1,2]. Biofuels derived from biomass include firewood, wood shavings, pellets, some fruit stones such as olives and avocados, as well as nutshells

Due to the wide availability of biomass worldwide, mainly because it can be obtained as a by-product of many industrial and agricultural processes, biomass represents a growing renewable energy source with high growth potential [3]. One of the main characteristics of biomass that makes it suitable as an energy source is that through direct combustion, it can be burned in waste conversion plants to produce electricity [4] or in boilers to produce heat at industrial and residential levels [5].

Towards a Sustainable Environment:

The world's population continues to grow at a high rate, and this has brought about a situation in which the percentage of the global energy used in cities is increasing considerably. But currently the world faces a major waste and a significant climate change. In many developing countries, over the past two and a half centuries, a variety of renewable power techniques have been actively pursued in distinct fields in of research, growth, demonstration, manufacturing, and implementation. A replacement for fossil fuels using waste biomass is essential and considered as a promising strategy to meet our energy needs. At the same time, the emissions of greenhouse gas and managing municipal solid waste have to become crucial due to growing population demand

All bioenergy system like any other energy system results in some environmental impacts While certainly some are more favorable from an environmental point of view than others, it is not possible to say that there are energy systems without any impacts at all. In the case of bioenergy, the actual impact often depends more on the way the whole system is managed than merely on the fuel or the conversion technology.

It is objectively important for an environmental energy policy to arrive at pattern for energy consumption and supply the total environmental impact would be positively optimized. The pointer of an environmental impact energy policy is to analyze the beneficial impact resulting from the process of producing, converting and using energy.

Environment and Bio-Energy:

(i) Land-Use

Bio-Energy implementation requires land. Furthermore, biomass has low relative energy density, which by Implication means large area of land is required to support bioenergy program. Thus, it is going to be environmentally sustainable to integrate an agroforestry system which will implement growing of food as well as grazing animals.

(ii) Air Pollution

Biomass fuels cause various forms of air pollution upon their combustion but this is far less than the emission caused by fossil fuel. But it should be noted that the actual quantities of the pollutant emitted, however, it differs depending on the type of energy conversion system being implemented.

(iii) Water

Water is a crucial aspect in bioenergy development. The availability of the needed amount can be deciding factor for the biomass growth. Too little water can stop or reduce the growth and too much water can cause waterlogging, salinity, and eventually stop biomass growth. A proper management of water supply will directly impact on the yield of biomass production

It's important to note that increased biomass production for energy if not accompanied with sound strategic water management effort can have negative impact on the surroundings and even waterbodies.

(iv) Socioeconomic Impact

This finding will provide an efficient tax/subsidy and pricing policy recommendations which will directly promote the investment in the energy system. It's crucial to note the environmental advantages whether quantifiable or not, should be properly valued in some integrated framework.

(v) Climate Change and Air Quality

Bioenergy offers significant potential to mitigate climate change by reducing life-cycle greenhouse gases emissions relative to fossil fuels. Although producing and burning biomass-based fuel releases carbon dioxide, biomass absorbs carbon dioxide from the atmosphere as it

grows. In contrast, using fossil fuels releases carbon that had been sequestered for long periods of time, causing a net positive increase in atmospheric carbon

(vi) Soil Health and Agronomics.

Growing biomass for fuels and power requires healthy soil that can maintain productivity over time. Sustainable soil health involves minimizing soil erosion, maintaining soil carbon and other essential nutrients, and protecting the soil's physical and biological attributes.

Due to the wide availability of biomass worldwide, mainly because it can be obtained as a by-product of many industrial and agricultural processes, biomass represents a growing renewable energy source with high growth potential [3].

Conclusion.

Bioenergy systems if properly designed with sustainable management can yield significant benefits, to the environment. The right choice of biomass crops and production methods can lead to favorable carbon and energy balances and a net reduction in greenhouse gas emissions.

Bioenergy production systems need to be implemented and adapted to local conditions to avoid generating environmental problems. As a guiding principle, bioenergy crop systems can potentially provide benefits if implemented on land that is currently under annual row crops or is undergoing uncontrolled degradation.

Bioenergy collaboration with local communities is required as this will improve the social benefits and understanding of the current uses of the land. The food production, livestock grazing, and fuelwood gathering will not have negative impact in this systemic implementation. Bioenergy crop production can be a suitable alternative if designed in a participatory manner with those whose livelihoods will be affected.

* *Mariam Emiabata holds a B.Sc. in Geophysics from the University of Lagos (UNILAG). She is currently interning with ELRI*

Reference

[1] Mehedintu, A.; Sterpu, M.; Soava, G. Estimation and forecasts for the share of renewable energy consumption in final energy consumption by 2020 in the European Union. *Sustainability* 2018, 10, 1515

[2] Muresan, A.A.; Attia, S. Energy efficiency in the Romanian residential building stock: A literature review. *Renew. Sustain. Energy Rev.* 2017, 74, 349–363

[3] Li, Y.; Rezgui, Y.; Zhu, H. District heating and cooling optimization and enhancement—towards integration of renewables, storage and smart grid. *Renew. Sustain. Energy Rev.* 2017, 72, 281–294.

[4] Manzano Agugliaro, F. Gasification of greenhouse residues for obtaining electrical energy in the south of Spain: localization by GIS. *Interciencia* 2007, 32, 131–136. [Google Scholar]

[5] Perea-Moreno, M.A.; Manzano-Agugliaro, F.; Perea-Moreno, A.J. Sustainable energy based on sunflower seed husk boiler for residential buildings. *Sustainability* 2018, 10, 3407. [Google Scholar] [CrossRef]