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PLANT BASED BIOMASS ENERGY RESOURCES FOR SAFEANDSUSTAINABLE ENVIRONMENT

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Abstract

The potential energy comes in the forms that are stored like chemical, gravitational, mechanical and nuclear. The potential of energy from biomass resources depends on land availability. Currently, the amount of land devoted to growing energy crops for biomass fuels is only 19% of the world's total land area and only 0.5-1.7% of global agricultural land (Ladanai and Vinterback, 2009). Using bio-fuels as jet-fuel or vehicle fuel provide solutions to carbon emissions. Since biofuels are safe option for healthy and safe environment as they cause reduction in global GHG, thus provide the better replacement for fossil fuels. Biomass is the primary source of energy for nearly 50% of the total world's population (Karekezi and Kithyoma, 2006). It is the most important source of energy around 35% in developing countries (Hall, 1993) and wood biomass is a major renewable resource of energy in developing part of world (Hashiramoto, 2007). Present study highlights the major role of biomass energy in safe and sustainable development in the light of recent research. Sustainable development provides an appropriate balance between the existing economy, society and environment. It brings the concept of judicial use of available resources and helps to explore other means.

Key words:*Biomass, sustainable development, bio-energy, bio-fuels, hydrocarbons, renewable energy resources.*

Introduction

Energy is considered as a vital component of any society playing a major role in the development. Bio-mass (plant material) is a renewable energy resource because the energy it takes from sun. the plants capture the sun's energy through the process of photosynthesis. Plants release the contained sun's energy when burnt. In short, biomass works like a sort of natural battery for the storage of solar energy.Growth and development are the two main concerns of any society and to achieve them the fundamental source is energy (Dias et.al. 2004) whether it is derived from sun, the ultimate source of energy or by other conventional or non-conventional sources (Costanza and Daly, 1992). Energy consumptions can be divided into : (i) As electricity supply which is the utmost necessities of industrial and household work, (ii) As oil and gas consumption in transportation system (Lund, 2007).To meet the energy consumption for economic needs of our rapidly growing society sources of fossil fuels were utilized badly from the ancient time (Ghanadan and Koomey, 2005; Lund and Munster, 2006)

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Due to excessive and unplanned exploitation of resources cause an unbalanced environment (IEA, 2009).Burning of fossil fuels is one of the main causes of increased global greenhouse gases (GHG) emission in environment. Consequently, global warming (Hansen et. al., 2010), melting of glaciers, landslides, soil erosion and barren land production happened (Houghton, 2010). So there is a need of judicial use of resources arises. Beside non-renewable resources of energy, renewable sources of energy are better for our environment-health (Afgan and Carvalho, 2002, 2004). Renewable resources are very cost-promising i.e. affordable, so they are economically favours the society and they are eco-friendly too as they provide clean energy. Biomass among all renewable resources seems much considerable and interesting because it provides energy security at very low cost, solves food n feed problems and minimise GHG emission.Plants absorb carbon-dioxide for the photosynthesis hence production of energy crops should be considered as they provide not only future fuels but also balance the CO_2 emission. This will definitely reduce our dependence on fossil fuels.

Sustainable and Safe Development

Sustainable development refers to a growth and development of society with judicial resource use (Brundtland, 1987).Sustainable development is a harmony between economy, society and environment. The overall goal of SD is the long term stability of the economy and environment (Emas, 2015). There are some questions arises like in SD what are those things that is supposed to be sustain, if sustained then for how long and what are those things which need to be developed. The answers are very clear we have to sustain our nature, earth, biodiversity, ecosystems, resources and communities for now and in the future so that we must able to develop people living, child survival rate, life expectancy, education, equity, equal opportunity, economy and overall society (Kates et al, 2005).

Sustainable development goals were advocated by United Nations, 'Transforming our World: The 2030 Agenda' as an initiative. It is an effort to provide equality to individuals giving them a safer environment with social and economic growth. Affordable and clean energy for everyone is one of the major agenda of SD.

BIOMASS:An Energy Resource:

Attaining the goals of Sustainable development renewable energy resources like solar energy, wind energy, hydropower and biomass, etc. are the best option to consider (Alnatheer, 2005). Among all these resources biomass potential for energy production seems promising (Fig. 1) (Ladanai and Vinterback, 2009). Biomass is not only used traditionally as energy source (dungcakes, fuelwood and charcoal) but their derivative biofuel such as biogas, bioethanol, biodiesel can also be utilized to fulfil present energy needs (Muller et.at. 2015, Turkenburg, 2000). Such plants which are used for production of biofuels are known as energy crops. Energy crops can be grown as a low cost and low maintenance harvest to make biofuels or combusted for its energy content to generate electricity or heat (Lund, 2007). Energy crops are also refer as petro-crops. Biomass energy is interesting due to their availability at local levels. Also, energy plantations generate employment in rural areas (Hoogwijk et al, 2003).

Calvin (1979) was the first who suggested utilizing photosynthetically produced hydrocarbons for energy production. He found that during photosynthesis some plants accumulate

hydrocarbons of high molecular weight which are similar to petroleum. These hydrocarbons are actually terpenoids and such plants are commonly called as petro- plants or petroleum plants. Asclepidiaceae, apocynaceae, fabaceae, sapotaceae, moraceae, dipterocaroaceae, asteraceae and most importantly euphorbiaceae are recognised as perto-plants families. Members of euphorbiaceae possess high amount of hydrocarbons. Besides higher plants algal hydrocarbons are also useful. Chlorococcales of green algae contains about 70% hydrocarbons approximately. These hydrocarbons are very much like crude oil and therefore can also be utilized as renewable source of energy. It is interesting to know that several oil-seeds producing plants are inhabitants of saline environment, these halophytes are mostly perennials and can grow in barren brackish water. These plants are also a good source of biofuels (Abideen et.al, 2015). Agricultural wastes can also be utilized as useful energy forms like biogas, bioalcohols, biohydrogen, etc.(Kothari et al 2010).

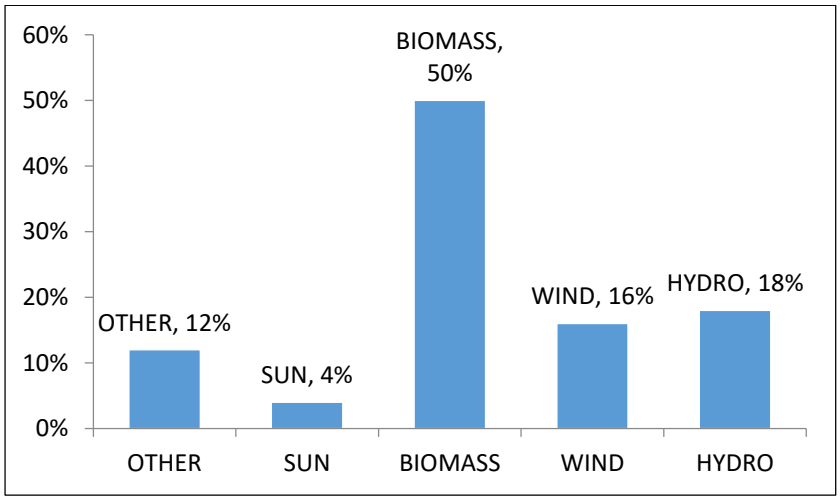

Fig 1: Relative Distribution of Renewable Energy

(Source: *renewable energy topic a, in all databases of ISI web of knowledge refined by energy source topic b, available at 2009-08-04).*

Conclusion

Our daily life directly or indirectly depends on energy consumption whether it is in form of electricity or combusting fuel which provides heat and energy. Sun is the ultimate source of energy for all life forms. Green plants are responsible for trapping solar energy and transforming it into chemical energy. This chemical energy was utilized by herbivores as food and later through different food chains energy transferred and stored to one trophic level to another. Biological energy demands of humans are also fulfilled by plants as food. Beside this Man is wise enough to utilize biomass energy resources for their electrical or thermal energy need. Conventional method of energy production by petrified biomass cause excessive damage to environment in terms of pollution. Hence plant based solutions are needed for a safer environment. Forest biomass provides energy supply without unbalancing the environmental factors and decreased the scope of further deforestation which is the present day demand. 31% forest cover present in world,and only 22.60% forest cover present in India (Fig.2).Energy

projects for harvestingforest biomass energy will not only increase employment but also awareness among people towards biodiversity conservation and their judicial utilization.

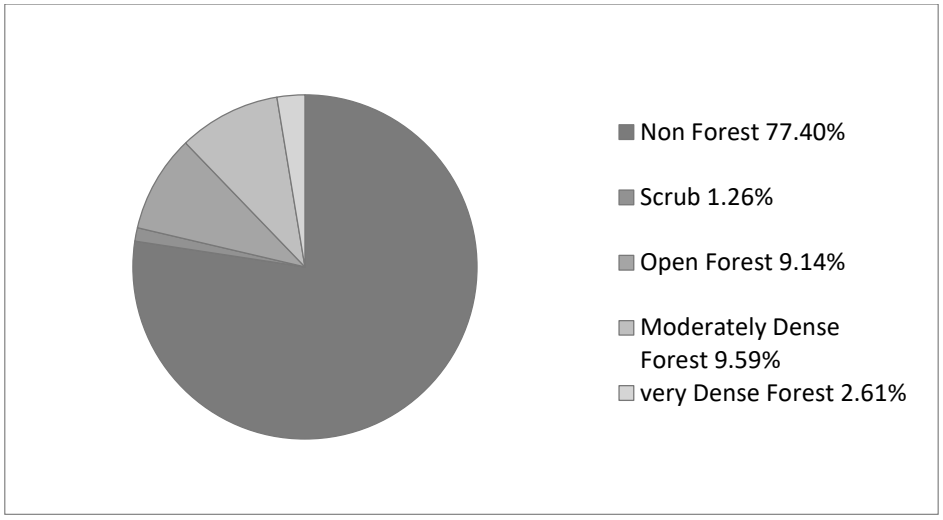

Fig.2: Forest Cover of India

(**Source**: India state of Forest report 2017).

Biomass can also be used as a renewable carbon feedstock in the production of synthetic organic materials such as basic chemicals, plastics, paint and solvents (Aston and Cassidy, 2007). Biomass can be used as materials also, which are eco-friendlier and biodegradable. Bio-materials can be used as energy recovery anytime but before that it can be recycled several times (Hoogwijk et al, 2003). Production of energy crops in large scale is still the topic of debate as it requires clearing of land for cultivation, but since most of the petro-crops are able to grow on barren land like *Jatropha* (Achten et al, 2010), thus it could be considered as future fuel. Oilseeds halophytes may provide land solutions as they are inhabitants of saline water which is mostly unsuitable for food crop (Abideen et.al, 2015). Several aquatic weeds viz. *Lemna*, *Azolla*, *Pistia*, etc., are also been identified as potential producer of bioenergy (Abbasi et.al, 1991; Jain et al 1992).

Social-ecological systems are constantly changing, more resilient systems are able to absorb larger shocks without changing in fundamental ways (Folke et al, 2002). Biomass energy harvesting will surely provide a more resilient social-ecological system which able to provide a complete picture for the solution for clean future fuel.

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