

# Biomass energy- a step towards sustainability

Radha Solanki Gulia

*\*Assistant Professor, Department of Environmental Sciences  
College of Vocational Studies, University of Delhi*

---

**Abstract**—One of the way out to overcome the gap between increasing energy demand and fulfilment of the needs is the use of biomass energy. It can help to reduce the dependence on fossil fuels. It is one of the potent alternative to fulfil the future energy demand in India. The biomass energy can be transformed into usable energy through various direct and indirect methods. It provides around 32% of primary energy presently and has a wide scope in coming future. The development and utilization of biofuels through processing of biomass energy can help to establish a sustainable energy system that can contribute to social and economic development of our nation without causing any harm to the environment. This work is of great significance to understand and gain the knowledge related to the development and utilization of biomass energy. It will be helpful to establish the relationship between the biomass energy consumption and the quality of environment. In recent years, interest in the biomass energy has increased because it is perceived as a carbon-neutral source of energy unlike other fossil fuels. It has a lot of future prospects for the researchers.

**Keywords:** biomass energy, development, consumption, biofuels, sustainability

## INTRODUCTION

Biomass has been a significant source of energy for the nation. Any organic material that has stored sunlight in the form of chemical energy is referred to as biomass. Biomass energy is energy generated or produced by living or dead organisms. Various sources of biomass energy includes wood and waste products from wood processing such as firewood, wood pellets, and wood chips, as well as sawdust and waste products from furniture and lumber mills and trash from pulp and paper mills. Biomass sources other than agricultural by-products include industrial residues, animal residues, municipal solid waste, sewage, and forestry residues. wood and waste products from wood processing, such as firewood, wood pellets, and wood chips, as well as sawdust and waste products from furniture and lumber mills and trash from pulp and paper mills. According to a recent study currently, India has access to around 750 million metric tonnes of biomass annually. According to the study, agricultural leftovers have an estimated surplus biomass availability of roughly 230 million metric tonnes per year or a potential of about 28 GW (Negi *et al.*, 2023). Besides this, 550 sugar mills in the nation could create an additional 14 GW of power through bagasse-based cogeneration provided they implemented the most efficient

levels of cogeneration from a technical and financial standpoint.

It is carbon-neutral, abundant, versatile, renewable and has the potential to generate significant job opportunities in rural areas. It is inexpensive fuel that provides organic enriched bio-manure to the farmers and reduces our reliance on fossil fuels. (Kothari *et al.*, 2020). Moreover, the biogas plants aids in delivering clean cooking, lightening and small amounts of thermal and electric power which reduces the emission of greenhouse gases.

## Ways to convert biomass into energy

- **Direct combustion-** All biomass can be burned directly for heating buildings and water, for industrial process heat and for generating electricity in steam turbines.
- **Thermochemical conversion** - Thermochemical conversion of biomass includes pyrolysis, gasification and thermal liquefaction. During the process the biomass feedstock materials are heated in closed and pressurized vessels called gasifiers at high temperatures to produce liquid fuels.
- **Chemical conversion** - A chemical conversion process is used for converting vegetable oils, animal fats, and greases into fatty acid methyl esters (FAME), which are used to produce biodiesel.
- **Biological conversion** -Biological conversion includes **fermentation** to convert biomass into ethanol, anaerobic digestion or Bio-methanation to produce renewable natural gas.

## Role of biomass energy to meet energy demand in India

- Bioenergy can help to meet the growing demand for energy within the country, especially in rural areas. Nearly 25% of its primary energy comes from biomass resources and close to 70% of rural population depend on biomass to meet their daily energy needs. Ministry of New and Renewable Energy (MNRE) has set the national target to achieve **10 GW of installed biomass power by 2022**.
- Bioenergy provides numerous benefits as compared to fossil fuels, in particular regarding GHG emissions. Biomass recycles carbon from the air and spares the use

of fossil fuels. It reduces the further addition of the fossil carbon from the ground into the atmosphere (Wang *et al.*, 2022).

- The market for renewable energy systems in rural and urban markets in India is set to grow exponentially. Plants like *Jatropha*, *Neem* and other wild plants are identified as the potential sources for biodiesel production in India.
- Biofuels can augment **waste to wealth creation**. Being a derivative of renewable biomass resources such as plastic, municipal solid waste, forestry residues, agricultural wastes, surplus food grains etc. **it has huge potential to help the country achieve the renewable energy goal of 175 GW** (Yasmeen *et al.*, 2022). **National Policy on Biofuels** is aimed at taking forward the indicative target of **achieving 20% blending of biofuels with fossil-based fuels by 2025**. Bioenergy can help in reducing the import of energy and boost India's energy security and self-reliance (Hung, 2022). Waste to energy projects are also being set up for generation of energy from urban, industrial and agricultural waste such as vegetable and other market wastes, slaughterhouse waste, agricultural residues and industrial wastes & effluents (Konuk *et al.*, 2021).
- Adopting biofuels as an alternative source of energy can significantly improve farmer's income, generate employment opportunities etc. (Li and Xue *et al.*, 2015). MNRE has further developed a policy for biomass and bagasse cogeneration that will help in meeting India's energy demands. It includes financial incentives and subsidies for both the biomass projects and sugar mills that use this technology.

### LIMITATIONS

Despite of so many advantages there are some limitations associated with the use of biomass energy. It includes lack of steady and consistent supply of biomass, land needed to produce biomass may be in demand for other purposes such as conservation or housing or agriculture use which may lead to a possible decrease in agricultural food production, difficult to store since they attract moisture, lack of infrastructure in transport facility, the process to retrofitted biomass co-firing equipment is expensive, lack of market for biomass pellets etc.

*Initiatives taken by the Government for the promotion of Biomass energy*

- **Fiscal Incentives-** Government gives 10 years Income tax holidays, concessional customs and excise duty exemption for machinery and components for initial setting up of Biomass power projects, general sales tax exemption is available in certain States.
- **National Biomass Repository-** MNRE also plans on creating a 'National Biomass Repository' through a nation-wide appraisal program which will help to ensure

availability of biofuels produced from domestic feedstock.

- Biomass co-firing is a method for efficiently and cleanly converting biomass to electricity by adding biomass as a partial substitute fuel in high-efficiency coal boilers. **Revised policy 2021** mandates the use of 5% biomass pellets made primarily of agro-residue along with coal in thermal power plants.
- **Cutting coal supply** -Government is considering cutting coal supply for those thermal power plants that do not comply with the policy on biomass co-firing (Negi *et al.*, 2023).
- **SAMARTH (Sustainable Agrarian Mission on use of Agro Residue in Thermal Power Plants)** -Provides for co-firing of biomass waste in Thermal Power Plants. **Energy Conservation (Amendment) Act 2022** specifies that all thermal power plants will have to use renewable fuel sources either as energy or feedstock.
- **E-Marketplace** - The biomass pellets can be procured through the government e-Marketplace by the thermal power plants.
- Through various other initiatives like Gobar-dhan schemes, Waste to Wealth, Swachh Bharat Mission, NAPCC etc, government planning to make biomass an integral part of the green energy revolution.

### CONCLUSION

The Power Ministry's National Mission for Biomass Utilization is yielding positive results to curtail air pollution in North West India. It also prevent the loss of fertility of agricultural land and provide a sustainable income source for farmers, suppliers and biomass fuel manufacturers. The Power Ministry has already set-up the National Mission on use of Biomass in coal based thermal power plants to address the issue of air pollution. The Government needs to issue a model agreement for procurement of biomass and must create a procurement portal for ease of doing business. Besides this the government should establish village level procurement centres as suggested but Niti Aayog.

### REFERENCES

- 1) Zhenglan, Li and Zhenhua, Xue., "Review of Biomass energy utilization technology", 3<sup>rd</sup> International conference on material, mechanical and manufacturing engineering, 2015.
- 2) Yasmeem, R.,Zhaohui, Cui.,Shah, W.H., Kamal, M.A.. and Khan, A., "Exploring the role of biomass energy consumption, Ecological footprint through FDI and technological innovations in B & R economics: A sustainable equation approach", *Energy*, 244 (A), 2022, pp. 122703.
- 3) Konouk, F., Zeren, F., Akpinar,S., and Yildiz, S., "Biomass energy consumption and energy growth: Further evidence from next-11 countries", *Energy Reports*, 7, 2021, pp. 4825-4832.
- 4) Hung, N. T., "Biomass energy consumption and economic growth: insights from BRICS and developed countries",

- 
- Environmental Science and Pollution Research, 29, 2022, pp. 30055-30072.
- 5) Wang, Y., Guan, W., Liu, L., and Ma, X., “Biomass energy consumption and carbon neutrality in OECD countries: Testing pollution haven hypothesis and environmental Kuznets curve”, *Front. Environ. Sci.*, 10, 2022.
  - 6) Kothari, R., Vashishtha, A., Singh, H. M., Pathak, V. V., Tyagi, V.V., Yadav, B.C., Veeramuthu, A.K., and Singh, D.P., “Assessment of Indian bioenergy policy for sustainable environment and its impact for rural India: Strategic implementation and challenges”, *Environmental Technology and Innovation*, 20, 2020, pp. 101078.
  - 7) Negi, H., Suyal, D.C., Soni, R., and Giri, K., “Indian scenario of Biomass availability and its bioenergy conversion potential”, *Energies*, 16(15), 2023, pp. 5805.