



Bioenergy from Biomass



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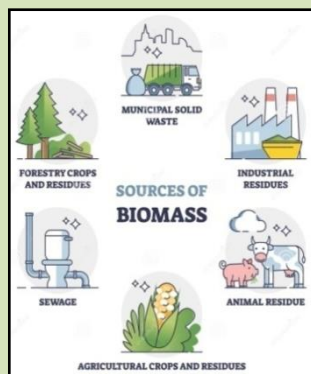
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Bioenergy is energy produced from renewable biological sources i.e. biomass. Biomass is any organic material which absorbs sunlight and stores it in the form of chemical energy. It is a form of renewable energy that is derived from living organic materials, which can be used to produce transportation fuels, heat, electricity, and energy products. The most common biomass materials used for energy are plants, seed, wood, seaweeds, and bio-waste from plant & animal. It makes a major contribution to the nation's renewable energy. It is one of many diverse resources available to help meet our future energy demand.

Types of Biomass

1) **Wood and agricultural products:** These are carbon-based materials generated as a by-product during the harvesting and processing of agricultural crops. It includes all sorts of agricultural waste such as straw, bagasse, stems, leaves, stalks, husks, pulp, shells, peels, etc. Other biomass sources include agricultural waste products like fruit pits, corn cobs, and wood-logs, chips, bark, and sawdust etc.

2) **Solid waste:** Power plants that burn garbage for energy are called waste-to-energy plants. These plants generate electricity using garbage much as coal-fired plants and used to fire an industrial boiler. Making electricity from garbage costs more than making it from coal and other energy sources. The



main advantage of burning solid waste is it reduces the amount of garbage dumped in landfills by 60 to 90%, and reduces the cost of landfill disposal.

3) **Landfill gas:** Bacteria and fungi degraded plants and animals biomass in natural process and produce flammable methane gas in anaerobic condition. Landfills can collect the methane gas, purify it, and then use it as an energy source for safety and environmental reasons.

4) **Alcohol fuels:** Wheat, corn, and other crops can be converted into a variety of liquid fuels including ethanol and methanol.

Categories of biofuels

Biofuels are generally classified into four categories. They are

i) First generation biofuels - First-generation biofuels are made from sugar, starch, and vegetable oil. Common first-generation biofuels include Bioalcohols, Biodiesel, Vegetable oil, Bioethers, Biogas. First-generation biofuel processes are useful but there is a threshold above which they cannot produce enough biofuel without threatening food supplies and biodiversity.

ii) Second generation biofuels - Second Generation Biofuel are also called “olive green” or “cellulosic-ethanol” fuel, and are produced from non-food crops. Waste vegetable oil, forest residue, industry residue, and sustainable biomass are the primary feedstock for the production of second generation biofuels.

iii) Third generation biofuels - Third Generation Biofuels are produced from micro and macro-organisms like algae. It is also known as “algal fuel” or “oilage” since they are produced from the algae. It is 10times higher than the second generation biofuel

iv) Fourth generation biofuels - The fourth-generation biofuels made from genetically engineered crops combine genetically engineered feedstock with genomically synthesized microorganisms, such as cyanobacteria, to efficiently generate bioenergy.

Biofuel production



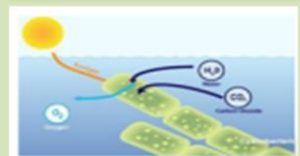
1st Generation



2nd Generation



3rd Generation



4th Generation