

# BIOMASS

An alternative energy resource



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# What is Biomass ?

- ❑ Biomass is a renewable energy source that is derived from living or recently living organisms.
- ❑ It includes dead trees, tree branches, rotting garbage, agricultural and human wastes like sugarcane, grasses and wood chips.
- ❑ Energy derived from biomass is mostly used to generate electricity or to produce heat.
- ❑ Biomass is found easily all over the world. It can be chemically and biochemically treated to convert it to a energy-rich fuel.

# Types of Biomass



**Wood**



**Crops**



**Garbage**



**Landfill Gas**



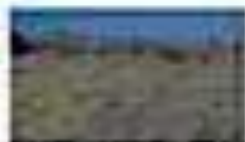
**Alcohol Fuels**



**AGRICULTURAL  
CROPS & RESIDUES**



**SEWAGE**



**FORESTRY  
CROPS & RESIDUES**

**biomass**  
**sources**

**INDUSTRIAL  
RESIDUES**



**ANIMAL  
RESIDUES**



**MUNICIPAL  
SOLID  
WASTE**



# Some idea about Biomass Sources



- Every year, the agricultural industry produces millions of tons of waste that could be utilized for energy production.
- In addition, the forest products industry also produces countless tons of waste that can be used as an energy source.
- Energy crops, such as willows and switch grass can be grown for the specific purpose of energy production.
- Farmers grow corn and soybeans that can be used for ethanol production

# What is Bioenergy?



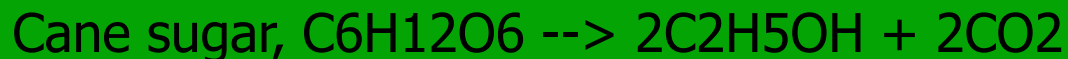
- The energy stored in biomass is called bioenergy.
- Bioenergy is very versatile: It can be used to provide heat, make fuels, and generate electricity.

# Technology of Energy Conversion



- Conversion of biomass to energy requires some **extraction** if the fuel stream is contaminated with polluting substances
- Typical processes are the following:
  - Direct combustion
  - Anaerobic Digestion
  - Fermentation
  - Pyrolysis
  - Other less-used techniques

Enzymes can change cellulose into sugars, which can then be fermented into alcohol



Fermentation of corn or other biomass will produce ethanol.

# How Much Biomass is Out There?

- “INDIA” has enough land and agricultural networks to sustainably replace half of the nation’s gasoline use or all of its nuclear energy.
- Millions of tons of unused agricultural waste, manure, and sawdust has the potential to generate energy.



# Biofuels



- Biomass is one of the few renewable sources for transportation fuels
- Biofuels produce fewer emissions than petroleum fuels
- The three main types of biofuels are :-

**Ethanol**

**Biodiesel**

**Biogas**

# Ethanol: a form of Biofuel

- Also known as ethyl alcohol or grain alcohol.
- Ethanol is made from the starch in certain grains, such as wheat, corn etc.
- Ethanol production usually begins with the grinding up of biomass such as wheat or corn.
- Once ground up, the starch or cellulose is converted into sugar.
- The sugar is then fed into microbes that use it for food, producing ethanol in the process.
- Ethanol Uses :--
- Most gasoline mixtures contain about 10 percent ethanol and 90 percent gasoline.
- All vehicles are equipped to handle this mixture.
- Such a mixture **reduces greenhouse gases by up to 4 percent.**

# E85 Fuel



- Fuel containing 85 percent gasoline and 15 percent ethanol can be used in flexible fuel vehicles.
- The use of E85 fuel **reduces the emission of greenhouse gases by up to 37 percent.**
- E85 is considered an alternative fuel under the Energy Policy Act of 1992.
- Vehicles that run on E85 are called Flexible Fuel Vehicles (FFV).
- Many vehicle manufacturers offer FFVs. Ford, Mercedes, GM and Chrysler all offer FFVs.
- Reduces Petroleum Consumption- Using E85 reduces dependence on foreign oil markets.



# Biodiesel



- Made by transforming animal fat or vegetable oil with alcohol .
- Fuel is made from rapeseed (canola) oil or soybean oil or recycled restaurant grease.
- It is directly used in place of diesel either as neat fuel or as an oxygenate additive

# Jatropha Tree

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- Biodiesel from Jatropha.
- Seeds of the Jatropha nut is crushed and oil is extracted
- The oil is processed and refined to form bio-diesel.



# Biodiesel benefits:-

The roll of biodiesel is not to replace the petroleum diesel, but to help create a balanced energy policy. Biodiesel is one of several alternative fuels designed to extend the usefulness of petroleum and the longevity.

## Easy to use:-

No vehicle modifications or special fuelling equipment is needed.

## Power, Performance and Economy:-

Proven performance and economy make biodiesel a renewable winner.

## Emissions & Greenhouse Gas Reduction:-

With lower exhaust emissions biodiesel is helping to reduce pollution and improve health. Lower CO<sub>2</sub> emission help reduce the impact of Global warning.

## Energy balance & security:-

Biodiesel helps reduce the need for foreign oil.

## Economical Development:-

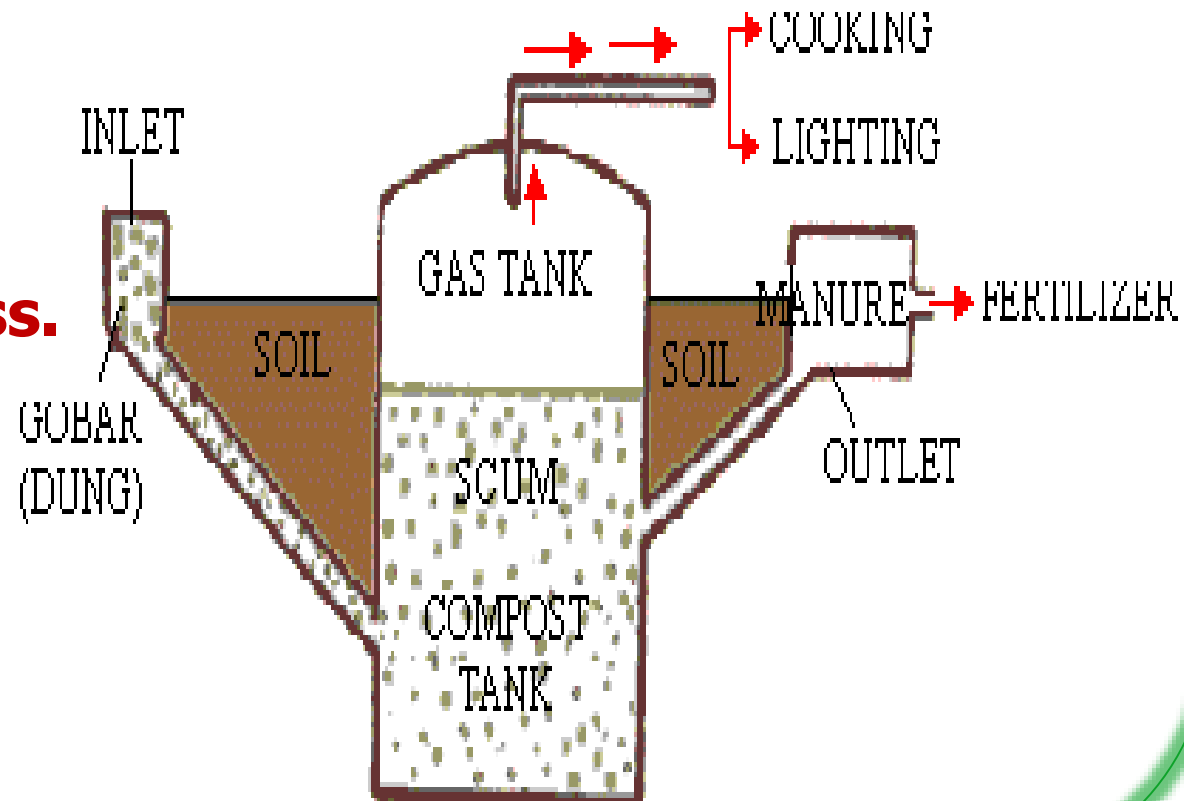
Biodiesel helps communities by keeping energy RUPEES at home.

# BIO-GAS

- **Methane** is the primary biogas.
- Landfill gas is primarily methane but contains CO<sub>2</sub> and other gases from plastics, etc.

- **Gobar Gas :-**

**Gobar gas production is an anaerobic process.**



# Some Idea about Methane

- ❑ Methane,  $\text{CH}_4$ , is a likely future hydrogen gas source
- ❑ The four H atoms allow more hydrogen to be produced per molecule of methane
- ❑ Cracking or pyrolysis changes the molecules to yield hydrogen and  $\text{CO}$ , which is also combustible
- ❑ The combination of methane and  $\text{CO}_x$  is known as biogas and can be made from acetic acid, produced from glucose by microorganisms.



# **Biobased Products**

- Biomass can also be used as a fuel to make everyday products that are usually produced using fossil fuels.
- Any product that we can make from fossil fuels can be identically made from biomass.
- Moreover, bio based products most often require less energy to produce than petroleum based products.

# Environmental & Economic Advantages

- Reduction of waste
- Use of waste that would normally go to landfills
- Extremely low emission of greenhouse gases compared to fossil fuels
- Ethanol is Carbon neutral and forms a part of the carbon cycle
- Growing variety of crops increases bio-diversity
- Helps developing economies by promoting agrarian communities
- Increase in jobs
- Increase in trade balance (Indian perspective) due to lesser dependence on foreign resources

# Biomass and The National Energy Policy

- The main goal of any country's National Energy Policy is to increase the domestic energy supplies.
- Biomass and biofuels will always be produced in a country like INDIA.
- As a result, the use of biomass directly supports the National Energy Policy by reducing INDIA's dependency on foreign oil.

...Will definitely help.

# Environmental Concerns(DISADVANTAGES)

\*Air Pollution



\*Soil Erosion



# Air Concerns

- Biomass processing technologies and biofuel's use have the potential to increase emissions of ozone precursors
  - Increase in  $\text{No}_x$  emissions
- Excessive inhalation of ethanol is harmful
- Combustion of ethanol would result in increased atmospheric concentrations of carcinogens (cancerous materials)
- Emission of relatively large sized particulate matter

# Soil Concerns

- **Burning biomass deprives local eco-systems of nutrients**
- **Production of dedicated energy crops renders land fallow**
- **Reduced land availability for cattle grazing**
- **Increased use of pesticides and fertilizers to produce energy crops contaminate ground and surface water**
  - **Affects fish and wildlife**

# Biomass and the Future

- More research is being conducted to improve technologies for making electricity and fuels from biomass.
- Some oil companies and petrochemical industries have begun to explore biomass energy.
- The biggest challenge is the cost of bioenergy: As long as fossil fuels remain cheaper than bioenergy, people will be hesitant to invest in this technology.
- Biomass is sustainable but there is an expense in producing, collecting, storing, transporting and converting biomass into fuels and electricity. It presents many challenges.
- Biomass Infrastructure will have to be built to ensure a safe and efficient supply system for biomass.
- While biomass is one of the best forms of renewable energy, but yet , it is not a great fuel.

# CONCLUSION

- ❑ Biomass is a **potential alternative** to fossil fuels but it is **not very viable** because there are many problems in the development and transportation of it and it also produces CO, CO<sub>2</sub> and some other pollutant materials just like fossil fuels. Thus, it also pollutes our beautiful environment, however lesser than the fossil fuels.
- ❑ Renewable Energy like BIOMASS has many advantages, but cannot and will not solve all of the world's energy problems on its own. Certainly, renewable resources have an important role to play within the context of a continuous and stable energy supply. All in all, however, renewable energy resources like BIOMASS are certain to play a **LARGE** and **growing role** in the "**Next Century**".
- ❑ Consequently, **it can be used as an alternative of fossil fuels up to a certain limits**, as there are available a few better alternative energies like solar energy, wind energy etc.

Thanks for watching..!!