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REPUBLIC OF SOUTH AFRICA

# Biomass Energy



RENEWABLE & SUSTAINABLE  
ENERGY STUDIES

# What is Biomass?

- Through **photosynthesis** plants convert **sunlight energy** into **chemical energy**

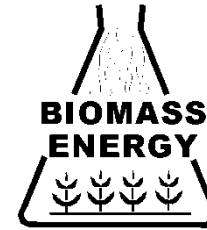
- **Biomass** is **stored sunlight energy** that can be converted to:

**Electricity**

**Fuel**

**Heat**






**Fertilizer**



# Biomass Energy

# Resources

- **Biomass** is **available** almost **everywhere** in the world
- Good biomass energy resources have a high yield of **dry material** and **use minimal land**
- Crops should **generate more energy** than their production consume
- **Biological power sources** are:
  - Renewable**
  - Easily stored**
  - CO<sub>2</sub> neutral** (if harvested sustainably)

Types of Biomass	
	Wood fuel
	Rubbish
	Alcohol fuels
	Crops
	Landfill gas

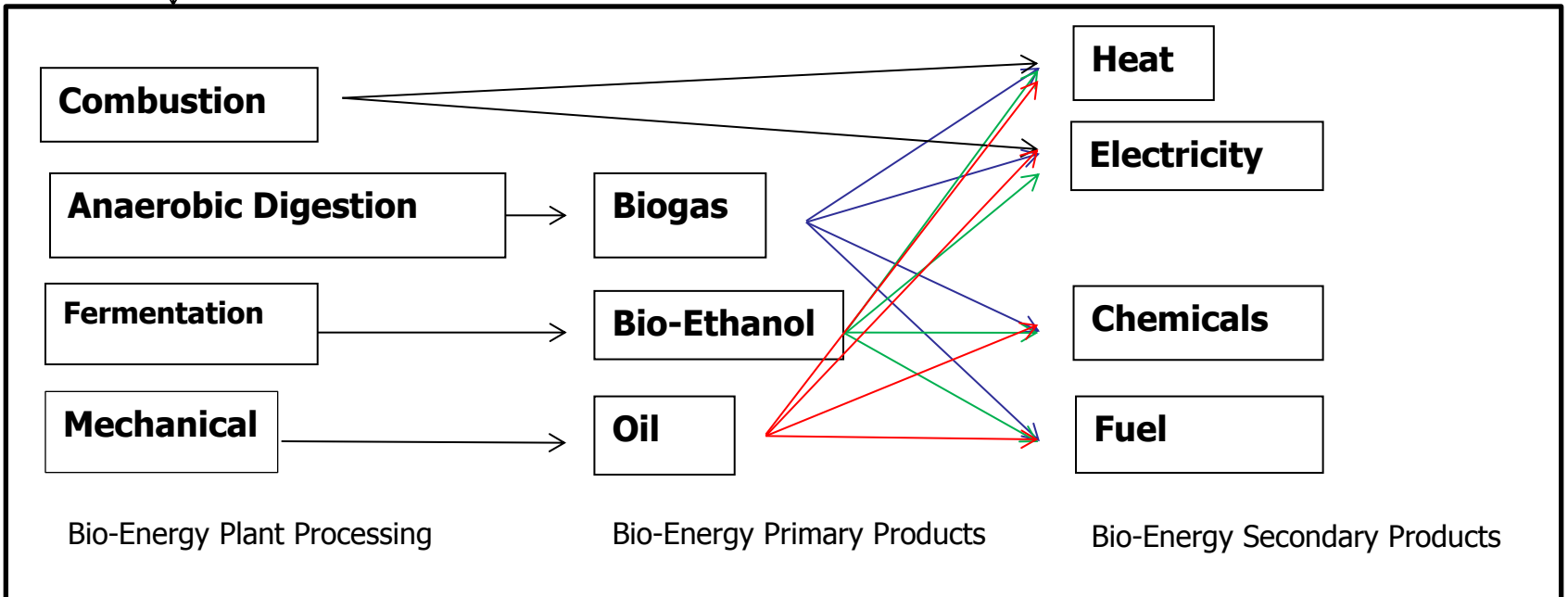
# Biomass Energy



# Biomass

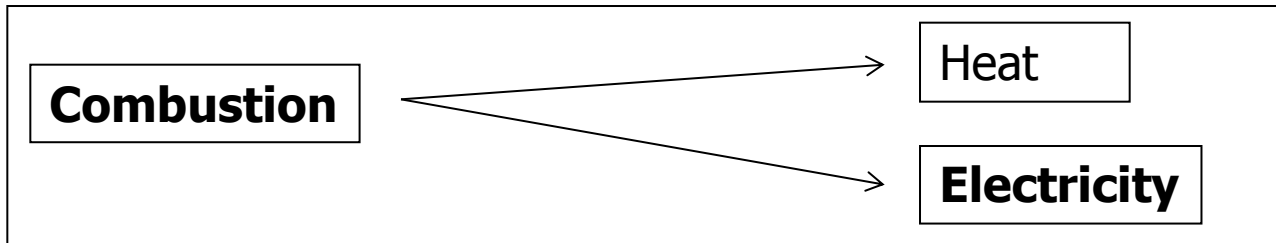
Harvesting;  
Processing

Transport to Bio-Energy Plant

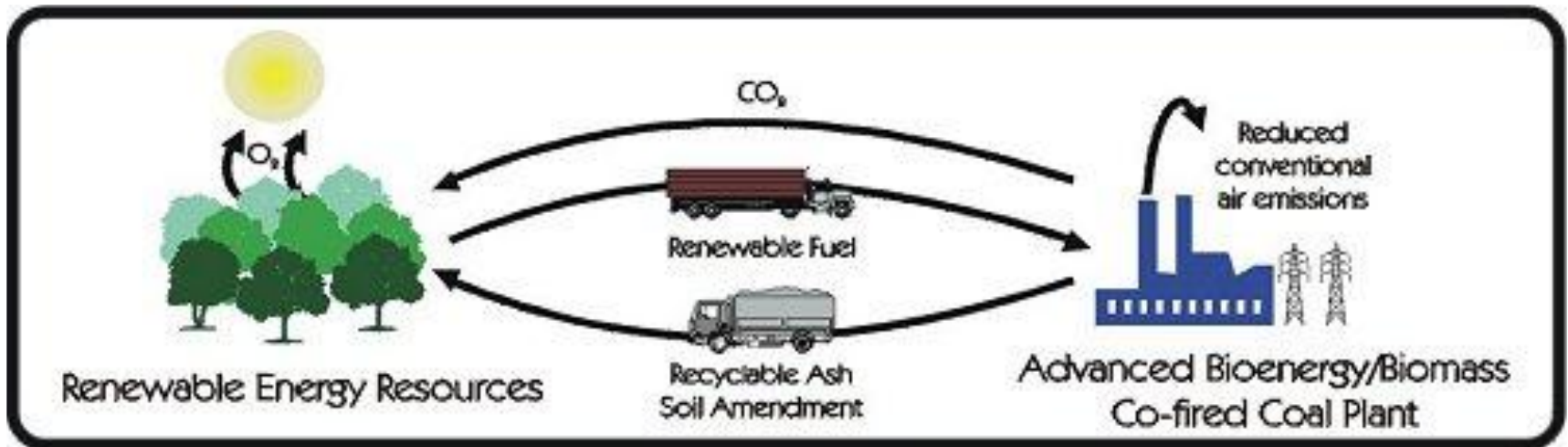


# Uses of Biomass

# Combustion: Electricity

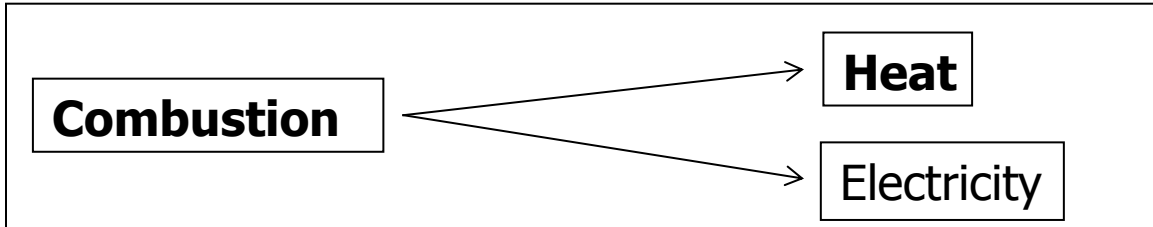


- **Biomass** can be **burned** in **power plants** to **generate electricity**
- In combined Heat and Power systems, the **waste heat energy** is also used to **heat water** or nearby **homes**.



## Uses of Biomass

# Combustion: Heating & Cooking



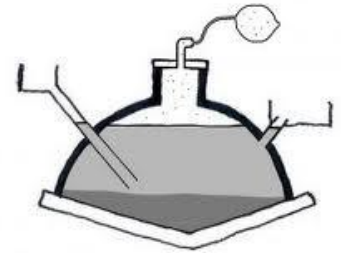
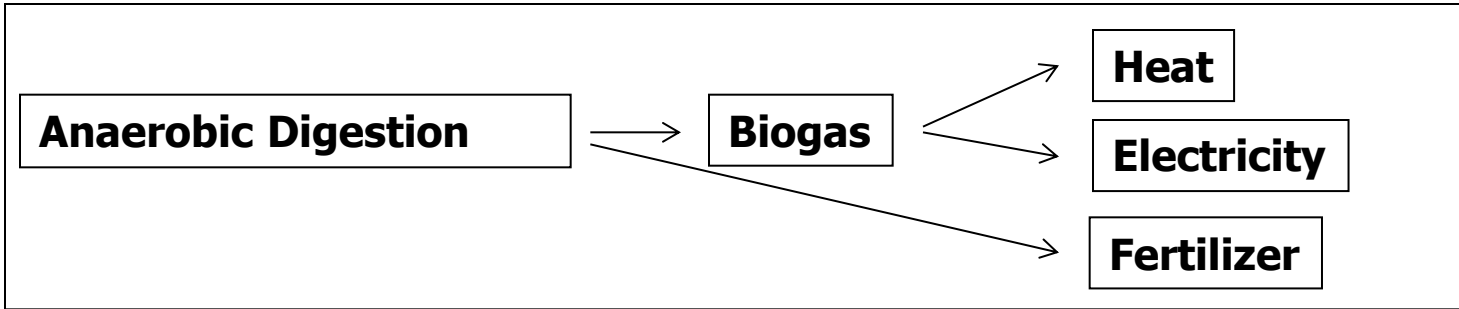
Wood can be burned to –

- **Heat** a house
- **Prepare food**



# Uses of Biomass

# Anaerobic Digestion: Biogas



- Biogas technology formalizes the natural **decomposition process** in the **absence of oxygen** = **anaerobic digestion**

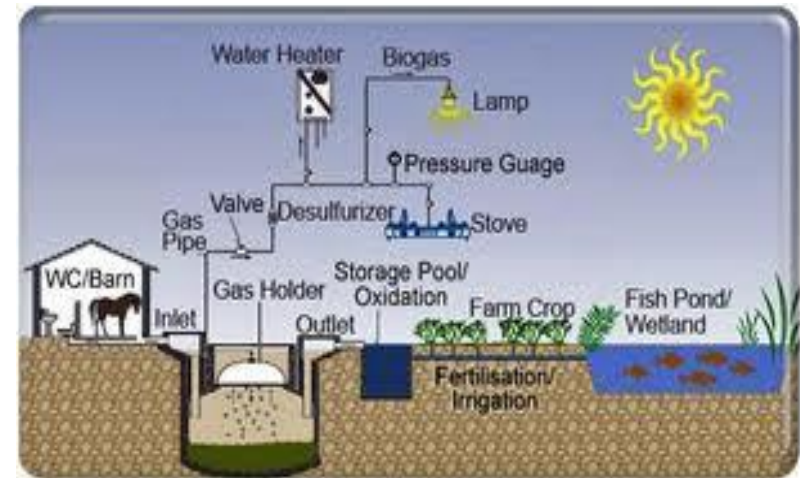
- **Biogas digester** consists of one or more **airtight reservoirs** into which a suitable moist feedstock is placed

- Digester can be big or small

- Compounds produced by this process is:

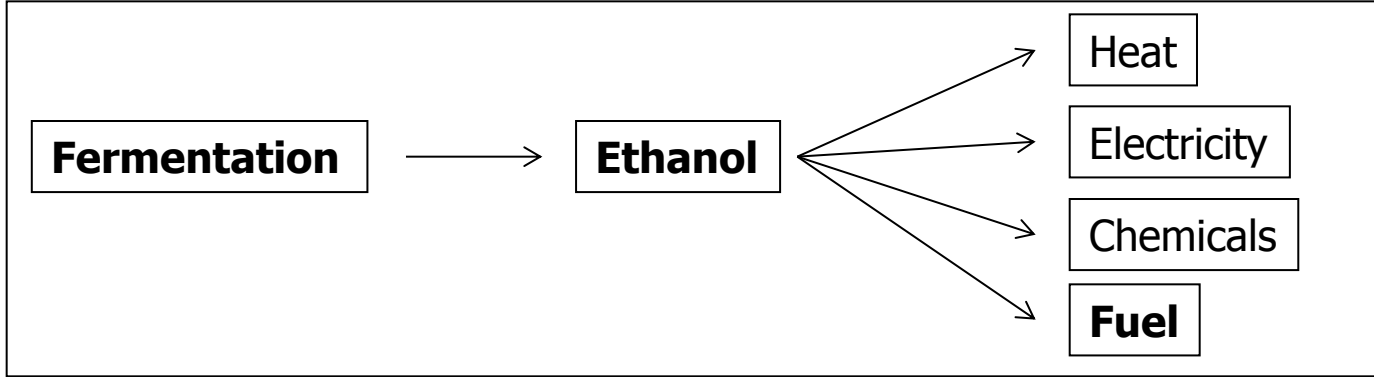
1. **Methane gas** = used for **heating, cooking & electricity**

2. **Odourless slurry** = excellent **fertilizer**



## Uses of Biomass

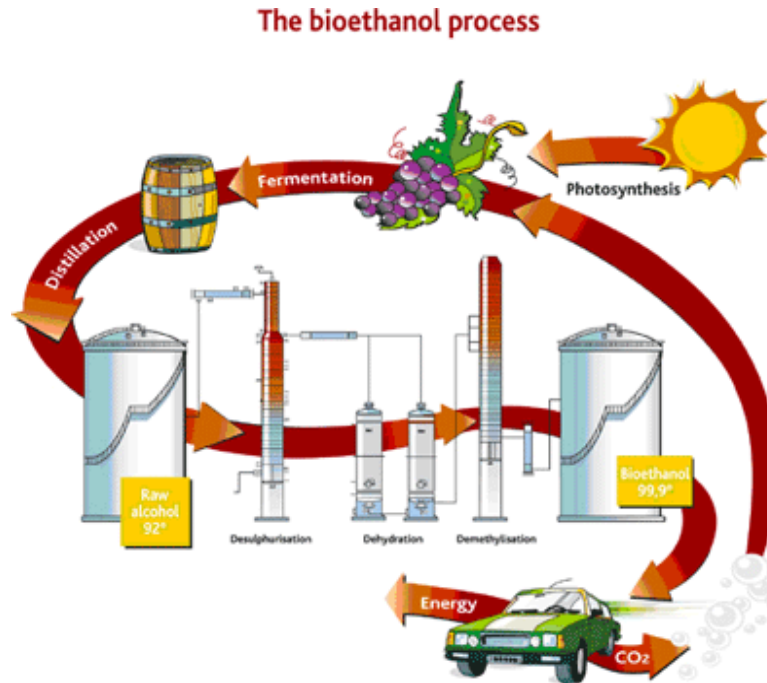
# Fermentation: Biofuel



- Biomass can be converted into **liquid biofuels** through **fermentation**

- **Maize** and **sugar cane** can be converted into:

1. **Ethanol** – a liquid biofuel
2. **Methane** – a gas

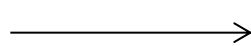


# Uses of Biomass

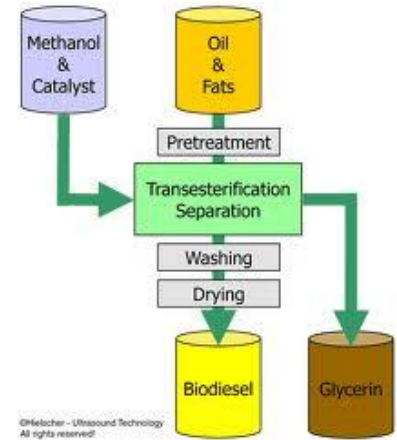
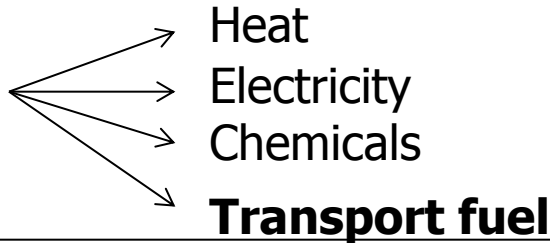


# Mechanical Processing: Biodiesel

**Mechanical Processing**



**Bio-oil**



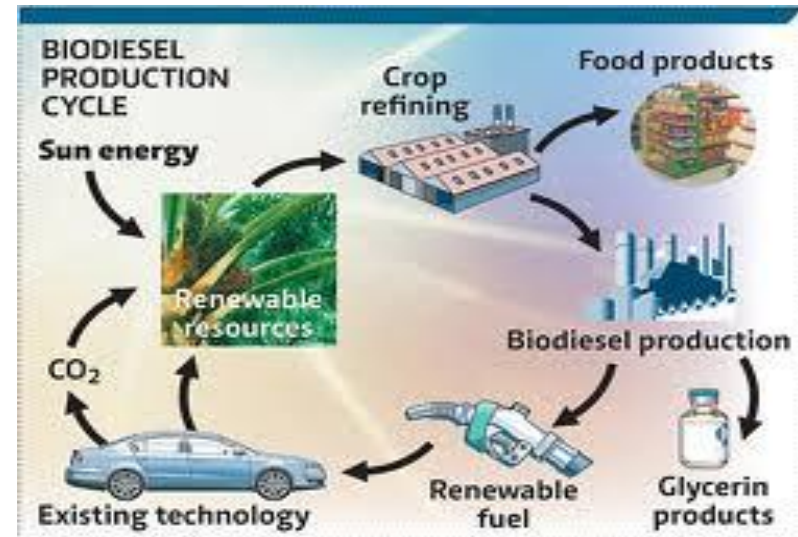
- **Sunflower seed oil** and **soybean oil** can be converted into **biodiesel**



- These fuels are **more effective than wood** = a more concentrated energy source

## Concerns:

- Effect of **monocrops** on nature?
- Dare we use **food** for **fuel**?



# Uses of Biomass