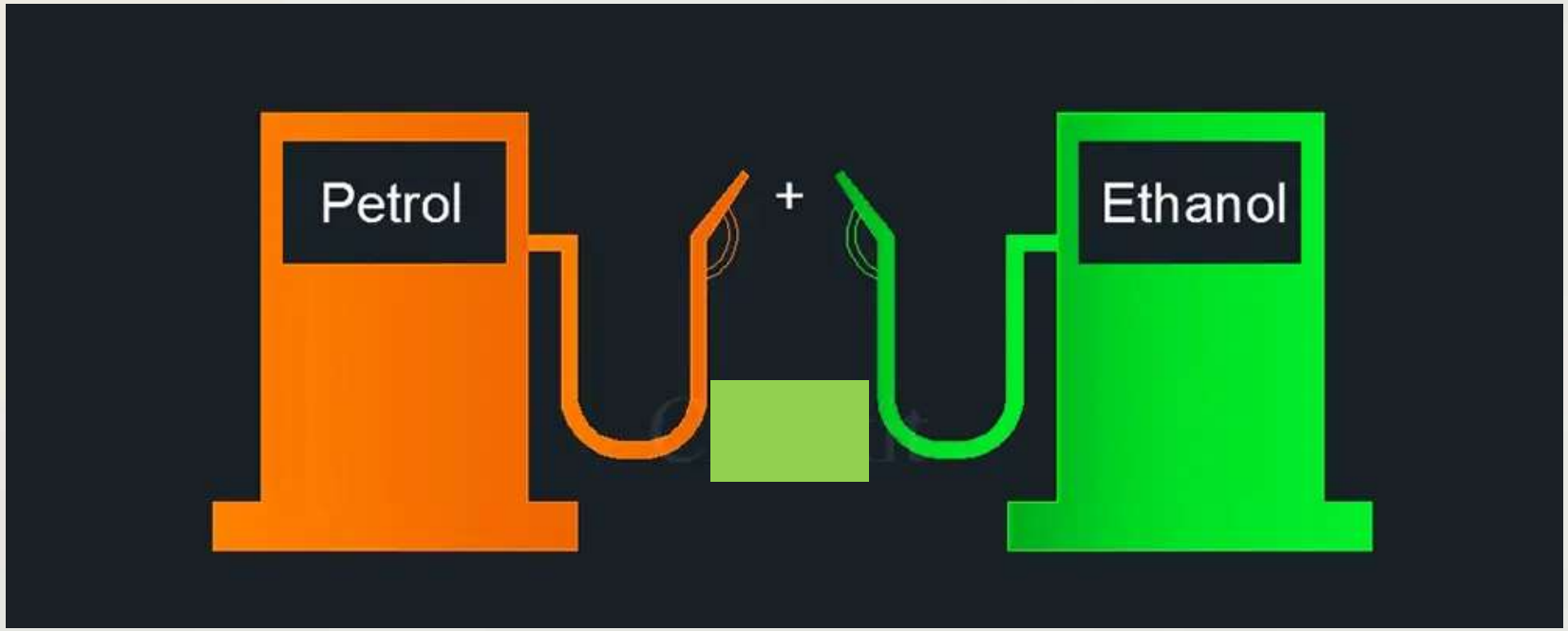
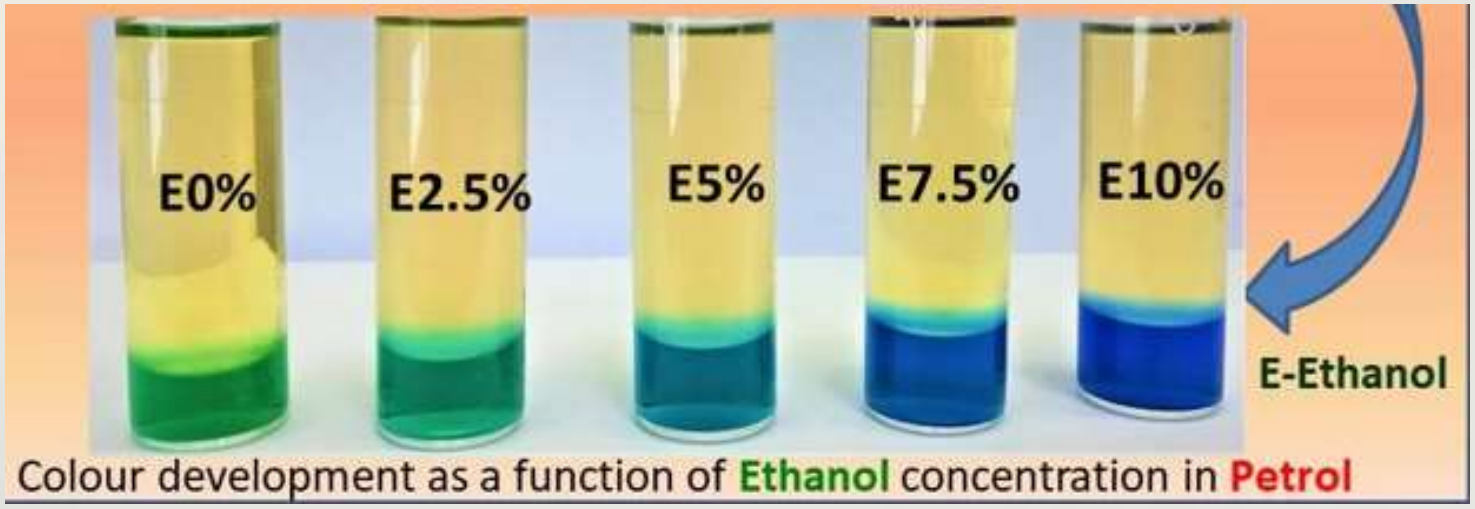
# Environmental Concerns Regarding Ethanol Blended Petrol



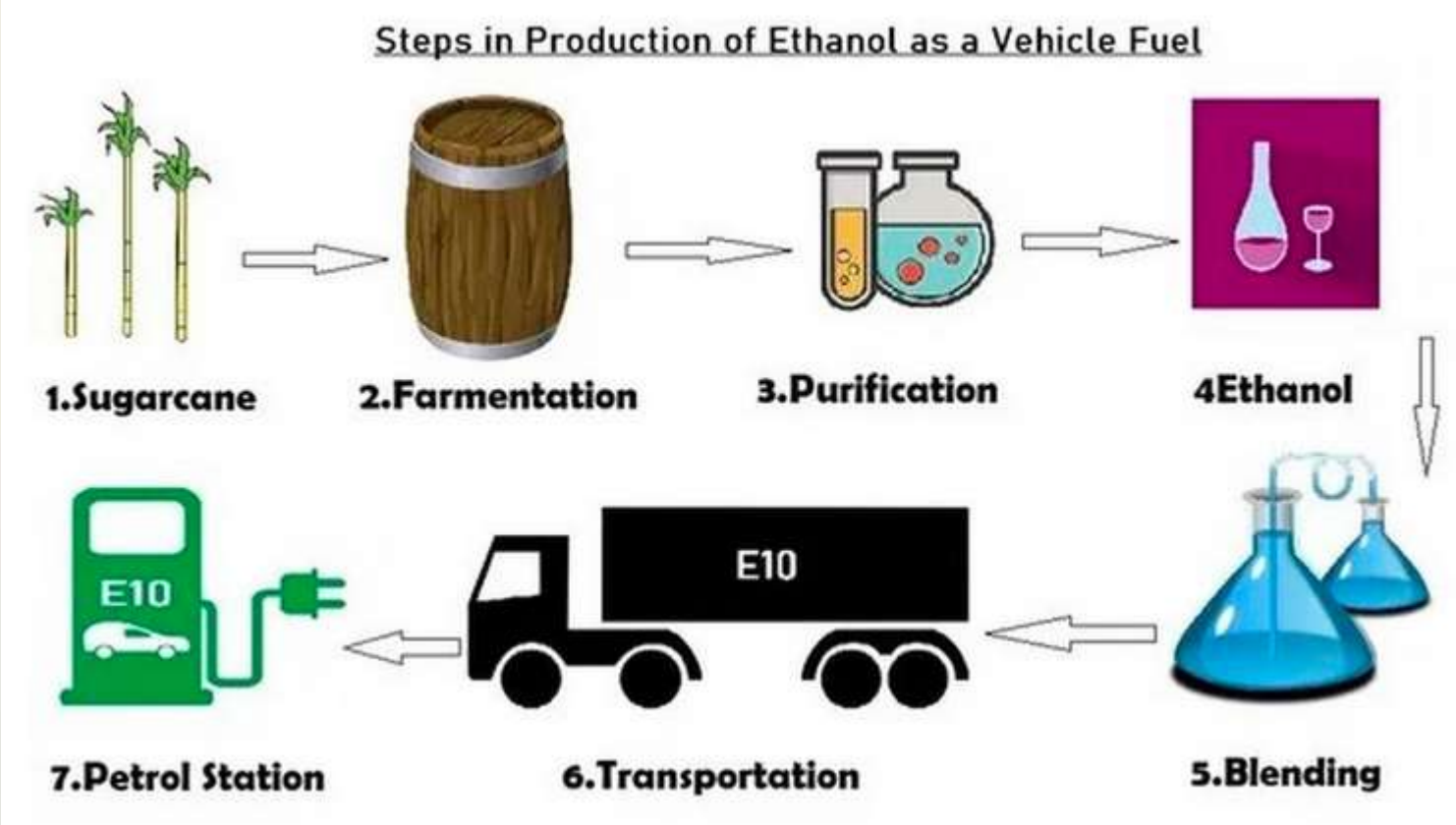
- The Ethanol Blended Petrol (EBP) programme is facing strong opposition in Andhra Pradesh (AP).
- Environmentalists and farmers are raising concerns over environmental pollution and excessive water consumption by ethanol factories.

## Ethanol Blending

- Ethanol blending in petrol refers to the practice of mixing ethanol, a type of alcohol/biofuel, with petrol to create a blended fuel.
  - E10, is the most common blend, which consists of 10% ethanol and 90% petrol.
  - E20, is a higher ethanol blend, which has 20% ethanol and 80% petrol.

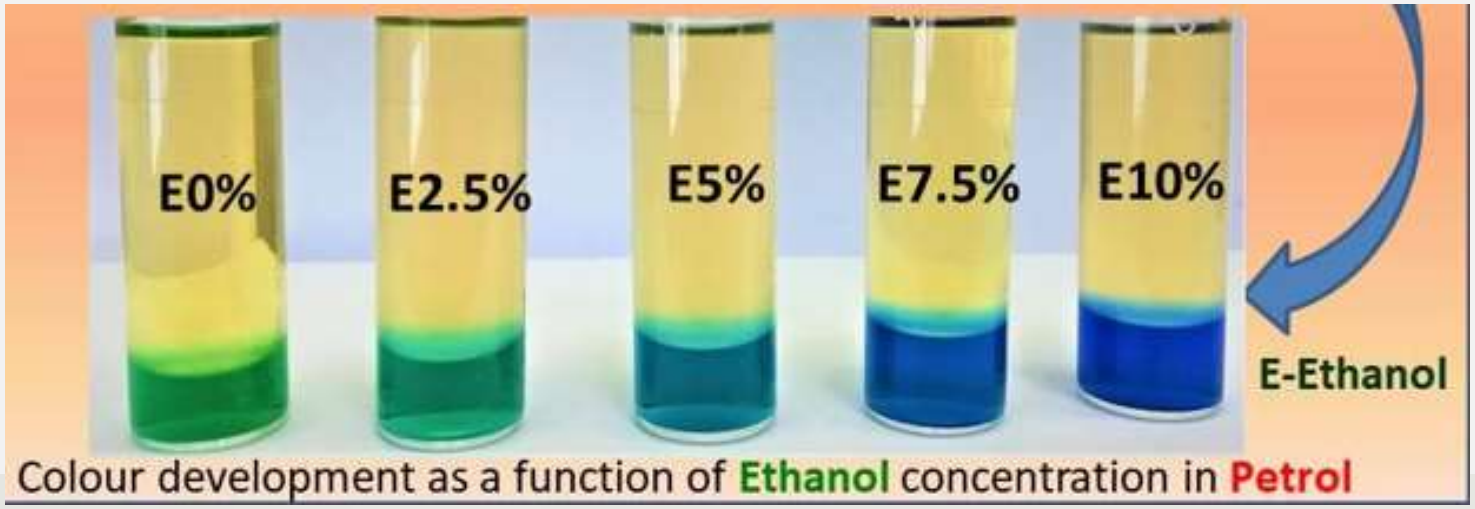


- **Ethanol is naturally produced by the fermentation of sugars by yeasts or via**
- **By petrochemical processes such as ethylene hydration.**



## What is Ethanol Blended Petrol Programme?

- The **EBP Programme began** with **pilot projects in 2001**. It was launched **by the Ministry of Petroleum and Natural Gas in 2003,** with **5% Ethanol ($C_2H_5OH$) blending** and **extended nationwide** (except Andaman & Nicobar, Lakshadweep) **by 2019, allowing up to 10% blending.**



Colour development as a function of Ethanol concentration in Petrol

- The EBP Programme now targets 20% ethanol blending in petrol by 2025-26 (advanced from 2030 under the National Policy on Biofuels-2018 (amended in 2022).

- As of 2024, the blend percentage stood at 15%.

## Objective:

- EBP aims to reduce carbon emissions, fuel imports, and increase farmer income.
- Support India's energy diversification, enhancing resilience to global oil supply disruptions.
- Help India achieve its Net Zero 2070 commitment under the Paris Agreement.

## Key Milestones:

- Ethanol production capacity reached around 1,600 crore litres as of September, 2024.
- By cutting crude oil imports, the EBP Programme saved Rs. 1,06,072 crore in foreign exchange.
- EBP has reduced $CO_2$ emissions by 544 lakh metric tons and substituted 181 lakh metric tons of crude oil.

## Ethanol

- Ethanol is a biofuel primarily produced from "first generation" (1G) sources like sugarcane molasses, juice, wheat, and rice,

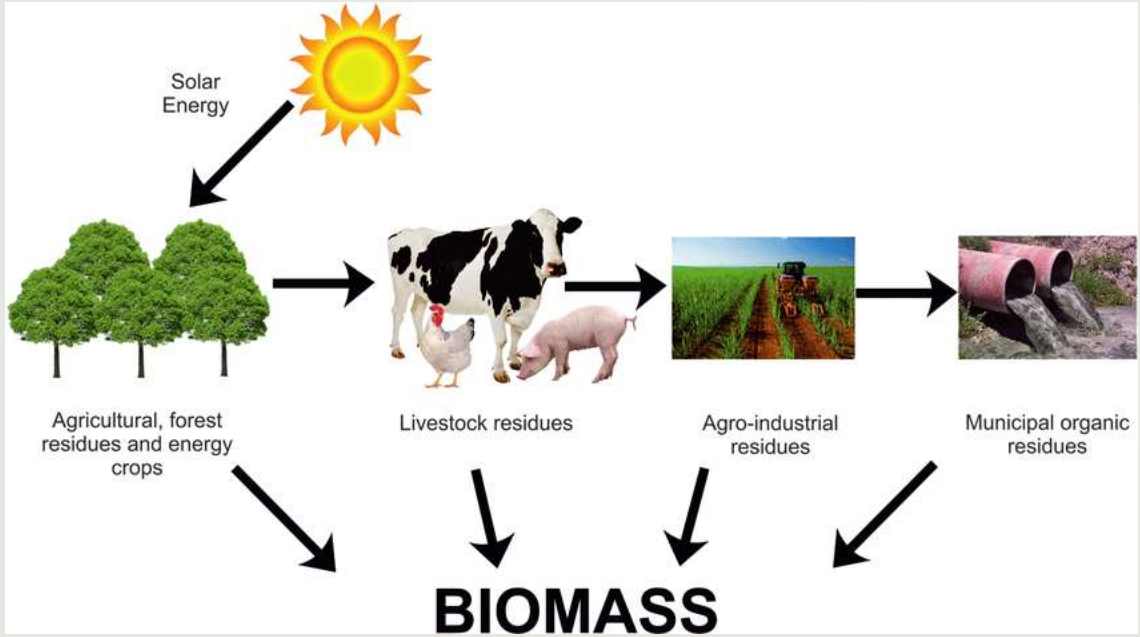
- while "second generation" (2G) sources include agricultural residues like rice straw, wheat straw, bagasse, and corn stover.

# Biofuels

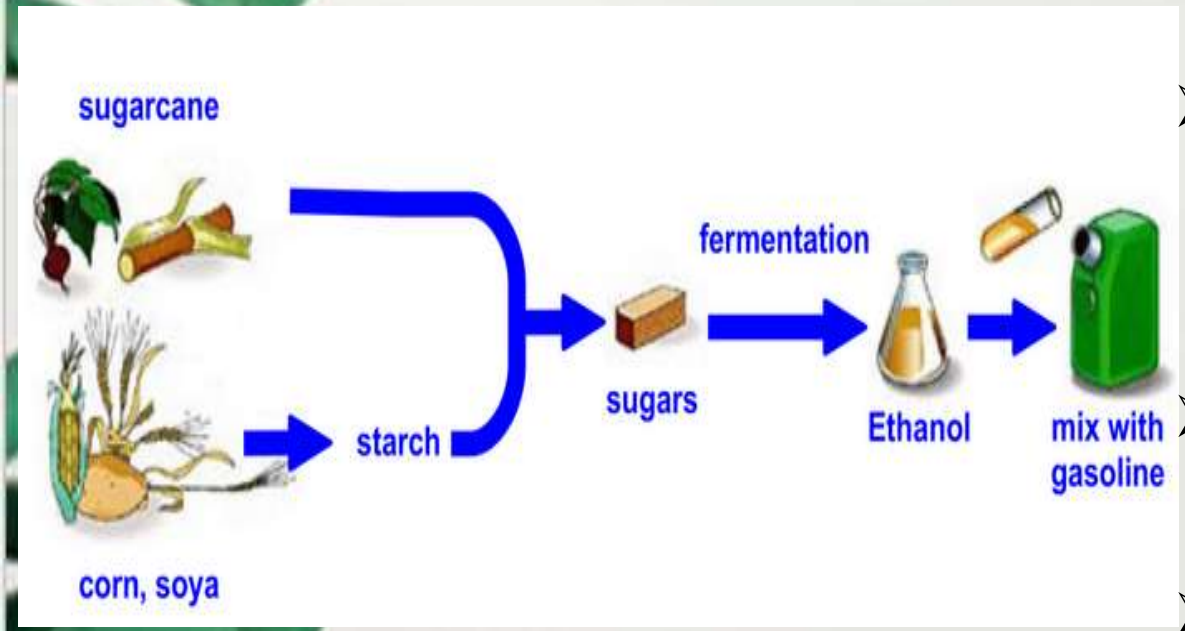
- Biofuel, any hydrocarbon fuel that is derived from biomass (organic matter )—that is, plant or algae material or animal waste.

- Biofuels may be solid, liquid or gaseous in nature.

- Solid: Wood, dried plant material, and manure
- Liquid: Bioethanol and Biodiesel
- Gaseous: Biogas (methane)



# Classification of Biofuels:

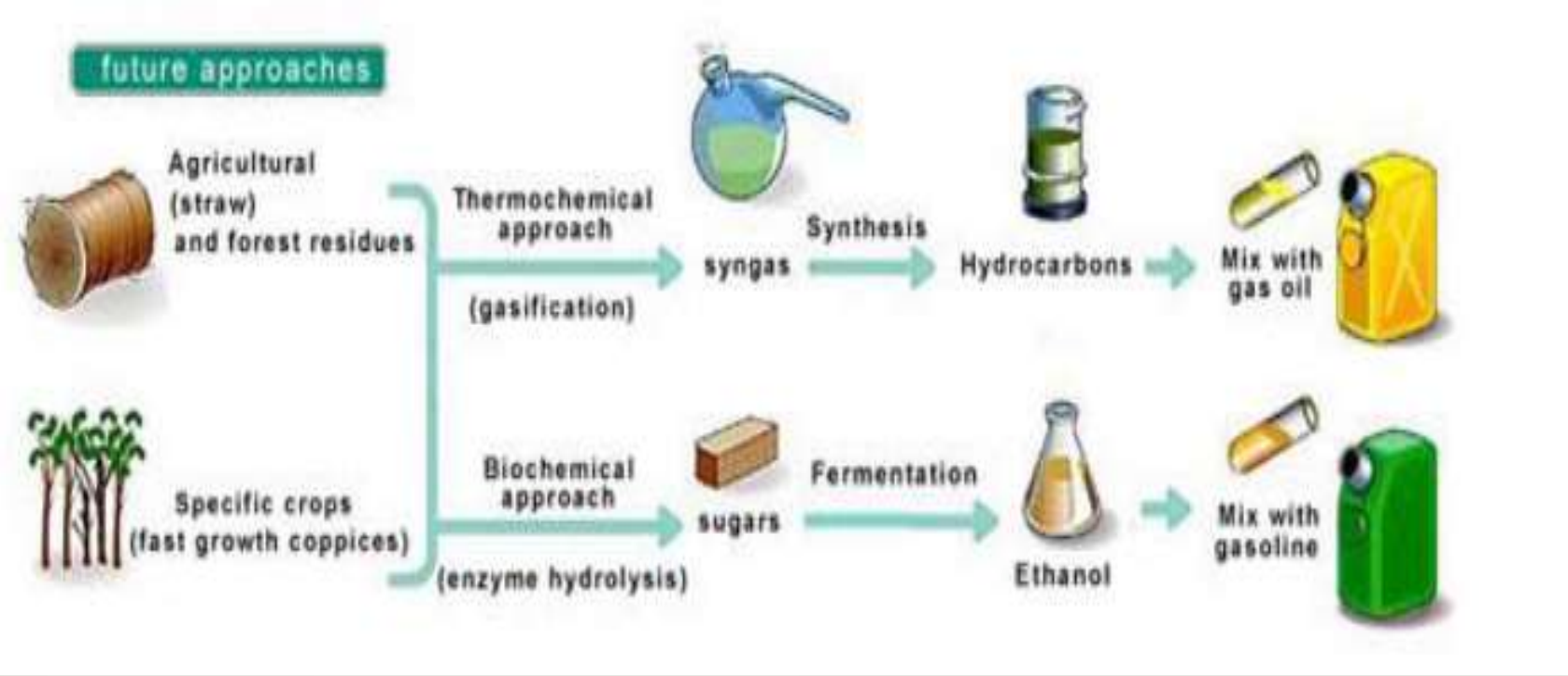


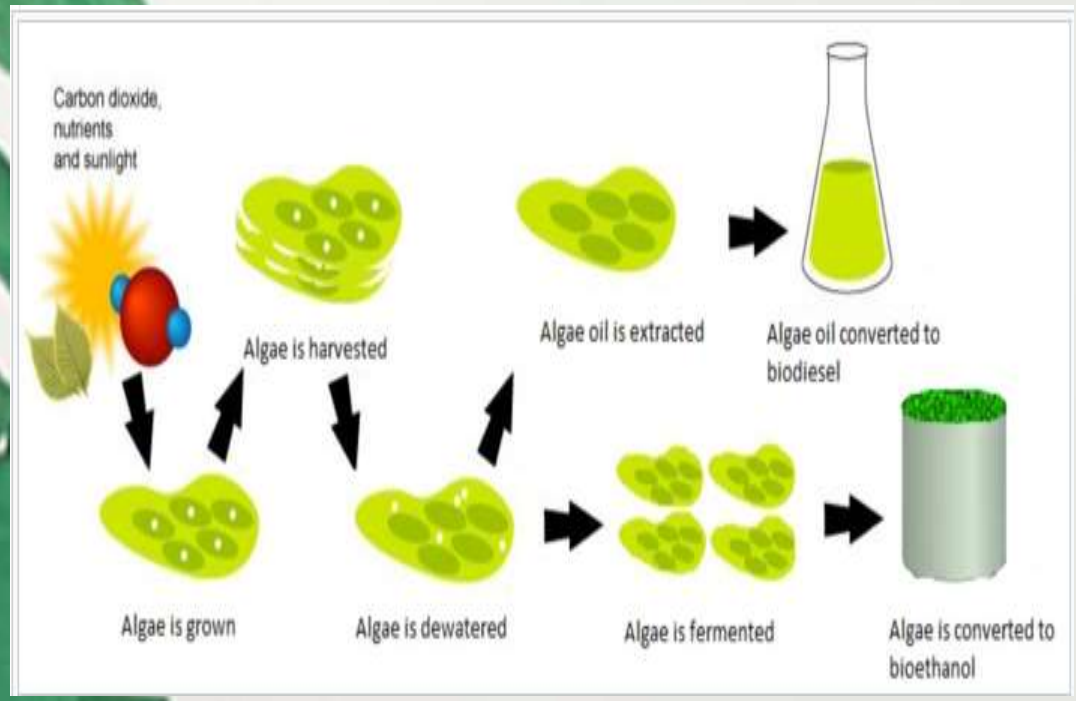

## 1st generation biofuels

- Any biofuel made from a feedstock that can also be consumed as a human food is considered a first-generation biofuel.
- these are made of all food products (sugar, starch, or vegetable oil).
- also called conventional biofuels.
- Eg bioethanol, biodiesel

## 2nd generation biofuels

- produced from sustainable feedstock.
- They are not food crops
- Second generation biofuels are often called “advanced biofuels.”






## 3rd generation biofuels

- derived from algae.

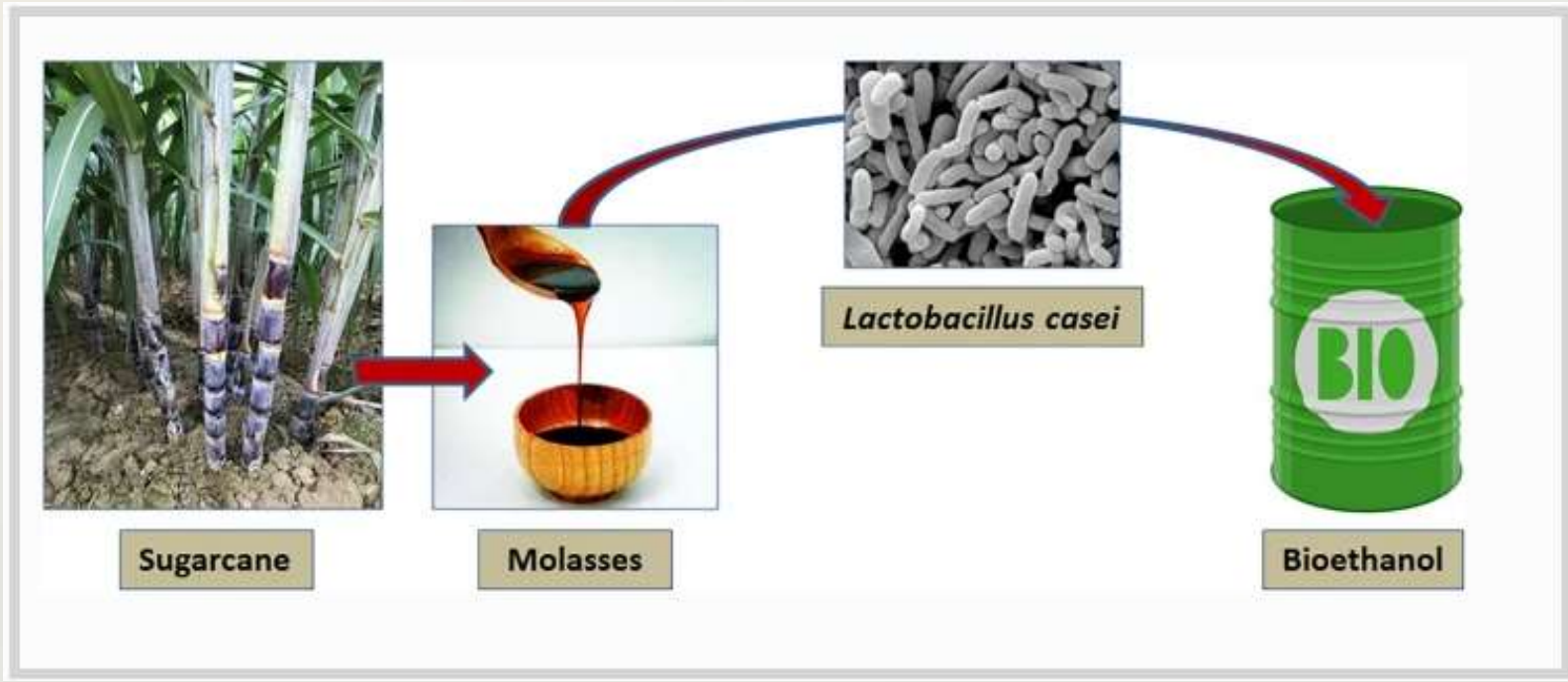
## 4th generation biofuels

- genetically engineered crops to take in high amounts of carbon are grown and harvested as biomass.
- Eg. Engineered algae

# Production of a Biofuel

- The production of a biofuel consists of growing an energy crop and using biomass obtained from the crop as a raw material for making liquid fuel.

- The production of bioethanol includes processes of fermenting sugarcane, corn, or other sugar-based feedstock and distilling the contents in a similar manner to distilling liquor,



## Key Ethanol Producing States

- ❑ Andhra Pradesh
- ❑ Maharashtra
- ❑ Haryana
- ❑ Punjab

## Benefits of Ethanol Blending

- As ethanol contains oxygen, it burns completely, emitting nil carbon dioxide.
- It is expected that the ethanol project will reduce greenhouse gases equivalent to about three lakh tonnes of $CO_2$ emission per annum.
- Using stubble of post-harvest for ethanol production reduces stubble-burning so as air pollution along with helping in increasing farmers' income.

## Drawbacks

- Even after it reduces carbon dioxide by a significant amount, but it does not reduce the emission of other key pollutants which as nitrous oxide.

- The water required to grow crops for ethanol is a matter of debate. It is said that sugarcane is the cheapest source of ethanol.

  On average one tonne of sugarcane can effectively produce 70 liters of ethanol which requires 2,860 liters of water.

- It may show some negative impact on food and fodder because of the diversion of resources for ethanol production. which has an impact on both the price of biofuels and the price of food crops.

# Impact on Environment

- Utilizing ethanol-blend gasoline reduces Carbon Monoxide (CO), Hydrocarbons (HC), pollutants.
- E20 fuel led to even greater reductions in carbon monoxide emissions, which were 50% lower in two-wheelers and 30% lower in four-wheelers.
- Compared to regular gasoline, ethanol blends have a 20% reduction in hydrocarbon emissions.
- Though it does not show much effect on nitrous oxide

## Environmental Concerns Regarding Ethanol Blended Petrol?

- **Pollution vs. Emission Reduction**: Achieving 20% ethanol blending target by 2025 requires around 1,000 crore litres of ethanol

## Water Scarcity

- Ethanol production is highly water-intensive, with grain-based factories requiring 8–12 litres of water per litre of ethanol.
- Sugarcane and molasses-based production contribute to high water consumption, deforestation, and industrial waste.
- Distilleries generate vinasse, a pollutant-rich wastewater that can contaminate water bodies and deplete oxygen if untreated.
- Factories near rivers like the Krishna are diverting water meant for agriculture and drinking. Farmers fear depletion of water resources, affecting crop production.

# Industrial Pollution

- Ethanol distilleries fall under the "red category" (pollution score of 60+) of industries due to their high pollution potential.
- Hazardous chemicals such as acetaldehyde, formaldehyde, and acrolein are emitted, increasing risks of respiratory diseases and cancer.
- In AP, many ethanol factories received environmental clearances without public hearings or proper emission assessments, often located near human settlements.

## Way Forward

- **Promoting 3G Ethanol:** Scaling up 3G ethanol production (produced by algae from wastewater, sewage or seawater) under the Pradhan Mantri JI-VAN Yojana can reduce environmental impact by using microalgae instead of food crops,

- It offers a sustainable alternative to 1G and 2G methods without straining food or freshwater resources.

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