



World Biofuels Day 2024

For Prelims: Biofuels, Types of Biofuels, [Ethanol Blending Program \(EBP\)](#), [National Policy on Biofuels](#), Differential Ethanol Pricing.

For Mains: Ethanol, Ethanol Blending Program: Significance, Challenges, Government Policies and Way Forward.

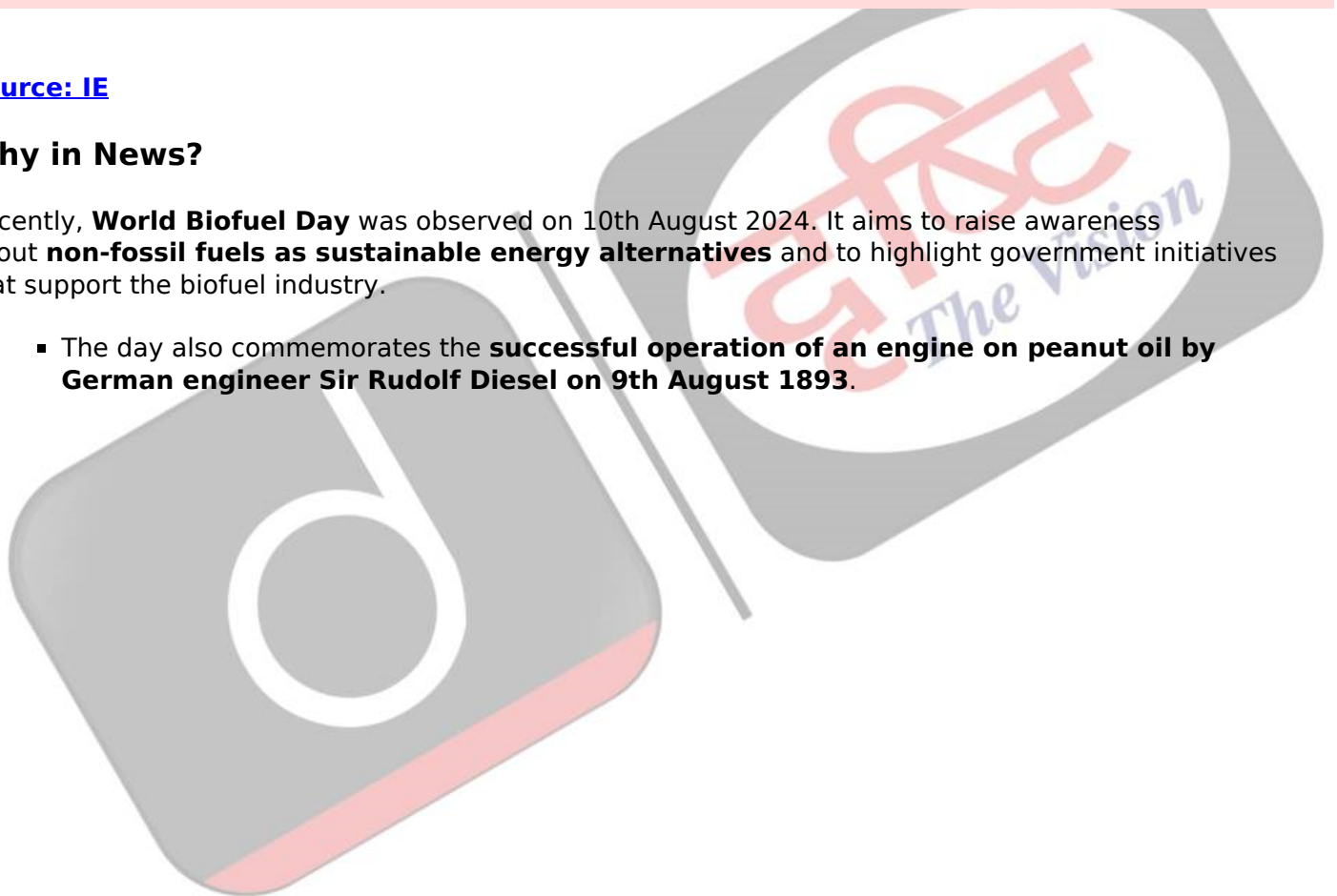
[Source: IE](#)

Why in News?

Recently, **World Biofuel Day** was observed on 10th August 2024. It aims to raise awareness about **non-fossil fuels as sustainable energy alternatives** and to highlight government initiatives that support the biofuel industry.

- The day also commemorates the **successful operation of an engine on peanut oil by German engineer Sir Rudolf Diesel on 9th August 1893.**

//



ETHANOL AS A FUEL

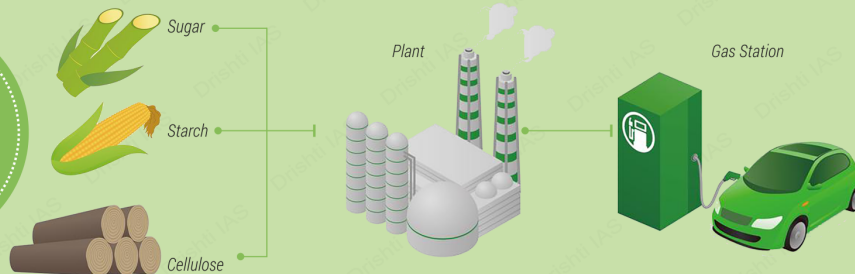
About Ethanol

- One of the principal biofuels
- Also called ethyl alcohol (C₂H₅OH)

Produced

- Naturally by fermentation of sugar (or corn, rice etc)
- By petrochemical processes (ethylene hydration)

World Biofuel Day is celebrated on 10 August to raise awareness about the importance of non-fossil fuels.



Ethanol Blending

Blending ethanol with petrol to burn less fossil fuel while running vehicles.

Blending Target

- 20% ethanol blending in petrol (E20) by 2025

Currently, ethanol makes up 10% of the petrol used in vehicles.

Significance

- Reduce oil imports
- Equivalent efficiency at a lower cost than petrol
- Burns completely and cleaner than petrol
- Ethanol produced from farm residue to boost farmers' income

Challenges in Success

- High land requirement for sugarcane (+ consequent food prices issue)
- High water requirement of biofuel crops

Related Initiatives

- Roadmap for Ethanol Blending in India (Report by NITI Aayog) (2021)
- E100 Pilot Project (Network for production and distribution of ethanol) (2021)
- Pradhan Mantri JI-VAN Yojana (to boost 2G ethanol projects) (2019)
- The National Policy on Biofuels (2018)

What are Biofuels?

About:

- Biofuels are the fuel derived from the **biomass of plants or animal wastes**.
- It is commonly produced from **corn, sugarcane and animal waste like cow dung**.
- These come under renewable sources of energy.

Most Common Biofuels:

- Ethanol:** It is produced by **fermentation of crop residues** such as corn and sugarcane. After fermentation, the **ethanol is mixed with petroleum**, diluting it and reducing emissions.
 - The most common blend is **Ethanol-10**, which contains **10% ethanol**.
 - Ethanol used in fuel is 99.9% pure alcohol, while 96% extra neutral alcohol is used in potable liquor and 94% rectified spirit is found in paints, cosmetics, pharmaceuticals, and other industrial products.**
- Biodiesel:** It is a renewable, biodegradable fuel made from used **cooking oil, recycled restaurant grease, yellow grease, or animal fats**.
 - Its production involves **burning the oil or fat with alcohol** in the presence of a **catalyst**.

Significance:

- **Environmental Benefits:** Biofuels are crucial for **environmental sustainability** as they can help alleviate some of the negative impacts of fossil fuel use, such as **greenhouse gas emissions** and **resource depletion** and they also offer **improved waste management solutions**.
- **Energy Security:** India, the **world's third-largest crude oil consumer, imports over 85% of its oil**. With rising energy demand and heavy reliance on imports, biofuels can help **improve energy security**.
- **Economic Benefits:** Biofuels can **cut India's oil imports and import bill**, while also **boosting farm incomes** and **addressing surplus production of crops like corn and sugarcane**.
- **Abundant Availability:** Biofuels can be produced from a variety of sources, including crops, waste, and algae.



What are the Government Initiatives and Policies on Biofuels?

- **National Policy on Biofuel, 2018:** It aims to reduce import dependence by promoting fuel blending with bioethanol, biodiesel, and bio-CNG.
 - Key elements include the **Ethanol Blending Programme (EBP)**, production of **second-generation ethanol** (derived from forest and agricultural residues), increasing **local fuel additive production** under the **"Make in India"** program,

and **R&D in feedstock.**

- In May 2022, the policy was amended to **advance the 20% ethanol blending target** from 2030 to **2025-26.**

▪ **Reduced GST on Ethanol:**

- To encourage ethanol blending, the government **lowered** the **Goods and Services Tax (GST)** rate on ethanol used for blending under the **Ethanol Blended Petrol (EBP) Programme** from **18% to 5%.**

▪ **Pradhan Mantri JI-VAN Yojana, 2019:**

- It aims to boost **Second Generation (2G) ethanol** production from **cellulosic and lignocellulosic** sources, including petrochemical routes, by offering financial support.
- **Lignocellulosic biomass (or LC biomass)** refers to plant biomass that is composed of **cellulose, hemicellulose, and lignin.** For examples cereal straw, bagasse, forest residues, and **purpose-grown energy crops such as vegetative grasses.**
- The government has approved an **extension** of the scheme's implementation timeline by **5 years,** now running until **2028-29.**

▪ **GOBAR (Galvanizing Organic Bio-Agro Resources) DHAN Scheme, 2018:**

- It focuses on **managing and converting cattle dung and solid waste** in farms to useful compost, biogas and bio-CNG, thus **keeping villages clean and increasing the income of rural households.**

- It was launched under the **Swachh Bharat Mission (Gramin).**

▪ **Repurpose Used Cooking Oil (RUCO):**

- It was launched by the **Food Safety and Standards Authority of India (FSSAI)** and aims for an ecosystem that will **enable the collection and conversion of used cooking oil to biodiesel.**

▪ **Global Biofuels Alliance (GBA): It is a multi-stakeholder alliance to facilitate international cooperation and promote the use of sustainable biofuels.**

- It was formally **launched in 2023 by India** along with the leaders of the USA, Brazil, Italy, Argentina, Singapore, Bangladesh, Mauritius and the UAE on the sidelines of the **G20 Summit** in New Delhi.
- Additionally, it aims to **facilitate global biofuel trade** and provide technical support for national biofuel programs.

Note:

- The **first 2G ethanol project** was inaugurated in Panipat, Haryana in 2022.
- **Ethanol blending** increased from 38 crore liters in 2013-14 to over 500 crore liters in 2022-23.
 - **Blending percentage** rose from 1.53% to **12.06%**, reaching **15.83% in July 2024.**
- Oil Marketing Companies (OMCs) aim for a **20% ethanol blending target** by the end of Ethanol Supply Year (ESY) 2025-26, requiring approximately 1,100 crore litres of ethanol.
- A total of 1,750 crore litres of **ethanol distillation capacity** is needed to meet blending requirements.

Generations of Biofuels

First Generation

- Derived from edible plants grown on arable land.
- Ethanol and butanol produced via yeast fermentation.
- Crops include wheat, sugar cane, and oily seeds.
- Attributed as a potential reason for recent spike in food prices.
- Net energy negative.

Second Generation

- Produced from non-edible crops grown on non-arable land.
- Sources have high lignocellulosic content, which include wood and organic waste.
- Potential to be net energy positive.

Third Generation

- Produced from algae and other microorganisms.
- Resilient organisms that can be grown from sunlight, CO₂ and brackish water.
- Does not use arable land.
- Fastest growing of all biofuel sources.
- Potentially carbon neutral

Fourth Generation

- Genetic engineering of organisms for efficient production of biofuels.
- Includes altering lipid characteristics and introducing lipid excretion pathways.
- Aim to be carbon negative by creating artificial carbon sinks.

What are the Challenges Related to Biofuels?

- **Environmental Issues:** Biofuel production can **strain land and water resources, cause pollution**, and alter cropping patterns.
 - Producing **one litre of ethanol** from sugar **requires about 2,860 litres of water**.
- **Food vs. Fuel Challenge:** There are concerns about **balancing food security with energy security**, depending on the choice of feedstock and production methods for biofuels.
 - The availability and **cost of these feedstocks can fluctuate** based on factors like season, weather, market conditions, and policy changes.
- **Conversion Efficiency and Yield:** Ethanol production involves **pretreatment, hydrolysis, fermentation, and distillation**, with varying **efficiencies and yields** depending on feedstock type, process technology, and conditions.
 - For example, **lignocellulosic biomass**, which is more **abundant and diverse than sugarcane or corn**, requires more intensive and complex pretreatment and hydrolysis to break down the cellulose and hemicellulose into fermentable sugars.
 - The **conversion efficiency and yield of ethanol** also affect the **economic viability and environmental impact** of the production process.
- **Infrastructure and Distribution:** Ethanol production needs **robust infrastructure** for **transporting, storing, and delivering feedstock** and fuel, which can be **costly and face logistical and regulatory** challenges.
 - For example, **ethanol is corrosive and hygroscopic**, which means that it can damage or **contaminate the existing pipelines, tanks, and pumps** that are designed for gasoline or diesel.
- **Vehicle Compatibility and Performance:** Vehicles need **modifications** to run on ethanol-blended fuels or pure ethanol, affecting **engines, fuel systems, and maintenance** practices.
 - For example, Ethanol has a **lower energy density than gasoline**, which means that **more volume of ethanol is needed** to provide the same amount of energy, resulting in **higher transportation and storage costs**.

Way Forward

- **Production Boost:** Diversify **feedstock by using non-food sources and waste**, support R&D

for advanced biofuels, expand and **modernise production facilities**, and establish distilleries near **fuel depots to reduce costs and enhance logistics**.

- **Policy and Market Mechanisms:** Gradually raise the ethanol blending **mandate beyond 20% by 2025**, establish fixed-price contracts with oil companies to ensure market stability, and **invest in R&D for optimising blending ratios**, engine compatibility, and conversion technologies.
- **Technological Advancement:** Invest in improved **storage and transportation infrastructure**, collaborate with automakers to **develop ethanol-compatible engines**, and enforce strict quality standards for **ethanol to ensure performance and safety**.
- **Public Awareness and Education:** Launch campaigns to **educate consumers on the benefits of ethanol blending**, address misconceptions, and encourage adoption. Ensure **clear labelling of ethanol-blended fuels** at stations to inform choices.

Drishti Mains Question

Discuss the importance of India's Ethanol Blending Program in enhancing energy security, decreasing reliance on fossil fuels, and minimising environmental impact.

UPSC Civil Services Examination, Previous Year Questions (PYQ)

Q. Given below are the names of four energy crops. Which one of them can be cultivated for ethanol? (2010)

- (a) Jatropha
- (b) Maize
- (c) Pongamia
- (d) Sunflower

Ans: (b)

Q. According to India's National Policy on Biofuels, which of the following can be used as raw materials for the production of biofuels? (2020)

1. Cassava
2. Damaged wheat grains
3. Groundnut seeds
4. Horse gram
5. Rotten potatoes
6. Sugar beet

Select the correct answer using the code given below:

- (a) 1, 2, 5 and 6 only
- (b) 1, 3, 4 and 6 only
- (c) 2, 3, 4 and 5 only
- (d) 1, 2, 3, 4, 5 and 6

Ans: (a)