FTP Strategy for Biofuels

Why in News?

Recently, Feedstock-Technology-Product (FTP) has been stressed for the biofuel sector.

What are the technologies of biofuel production?

- **The F-T-P (Feedstock-Technology-Product)** - It provides a structured framework for embedding biofuels into industries like sugar, paving the way for a green economy.
- **Alcohol-to-Jet (ATJ) Technology** – It is a process for the conversion of alcohols to an alternative jet fuel blendstock.

  The CSIR-IIP pilot plant in Dehradun produces 30 liters of sustainable air fuel.

- **Bio-Methanation** – It converts organic waste into biogas, supporting circular bioeconomy principles.
- **Lactic Acid Technologies** – It is the process of developing bioplastics from PLA (polylactic acid) form using biofuels.

What are the types of biofuel products produced under FTP?

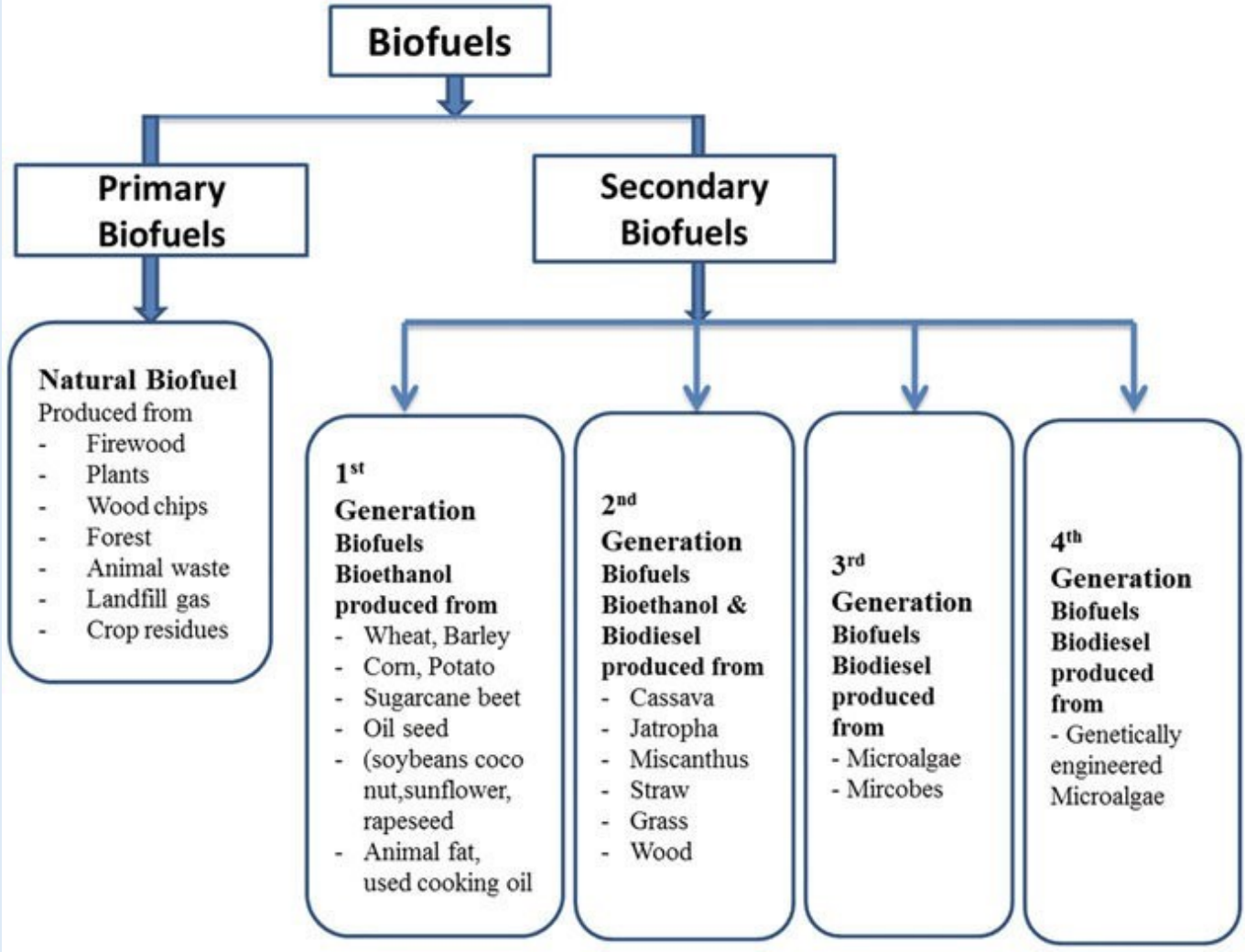
- **Ethanol (1G and 2G)** - The Ethanol Blending Programme (EBP) has driven ethanol demand, with India achieving record blending rates.
- **Sustainable Aviation Fuel (SAF)** - It represents a lucrative opportunity as global aviation embraces decarbonization.
- With the aviation sector eyeing biofuels as a compliance mechanism for climate commitments, India must position itself as a key SAF supplier.
- **Renewable Chemicals and Materials (RCM)** - Producing bio-based chemicals and materials can significantly enhance the sugar industry's profitability while reducing reliance on fossil-based inputs.
- **Bioplastics and Bio-Bitumen** - The rising demand for sustainable infrastructure materials and eco-friendly packaging aligns perfectly with these product lines.

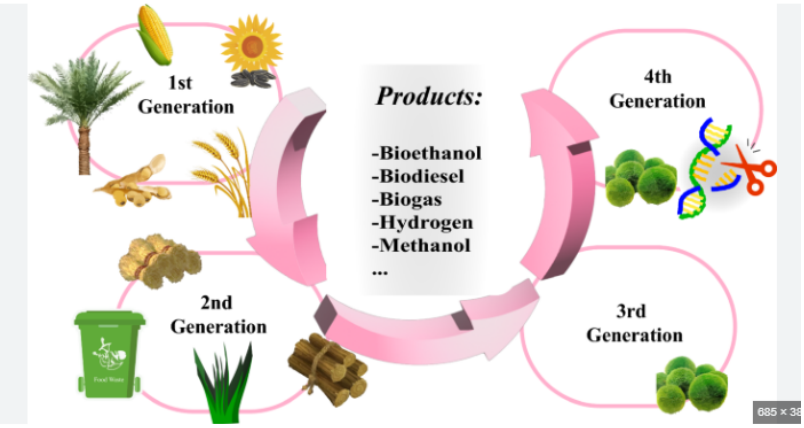
What are the benefits of FTP approach?

- **Fosters innovation** – Combining feedstock diversity, cutting-edge technologies, and diversified outputs, biorefineries
- **Sustainability** - This approach, not only achieves our energy goals but also set a benchmark for sustainable industrial transformation worldwide.
- **Integrated biorefineries** - When aligned with India's National Policy on Biofuels 2018, can help transform the sugar industry into an engine of sustainable growth.

- By combining feedstock diversity, cutting-edge technologies, and diversified outputs, biorefineries can:
- **Optimise resource utilization** – Biofuels production put resources like agri, bio resources, industrial plants, labour and capital effectively.
- **Rural development** – It helps the emergence of sustainable industrial hubs driving rural development.
- **Economic resilience** – This method strengthens the economy through energy independence, job creation, waste utilization rural development and market diversification.

Generation	Feedstocks	Example
First generation (1G)	Molasses, sugarcane syrup, and surplus grains.	Bioethanol, biodiesel, biogas
Second generation (2G)	• Non-food sources • Municipal solid waste, wood chips etc. • Agricultural residues like bagasse, rice straw.	Cellulose ethanol, biodiesel
Third generation (3G)	Algae- It consists of 40% of lipids which can be converted to biodiesel or synthetic petroleum.	Algal Biofuels Butanol, Gasoline, Jet fuel
Fourth generation (4G)	Genetically engineered bio algae	Biodiesels and other bio fuels and products.



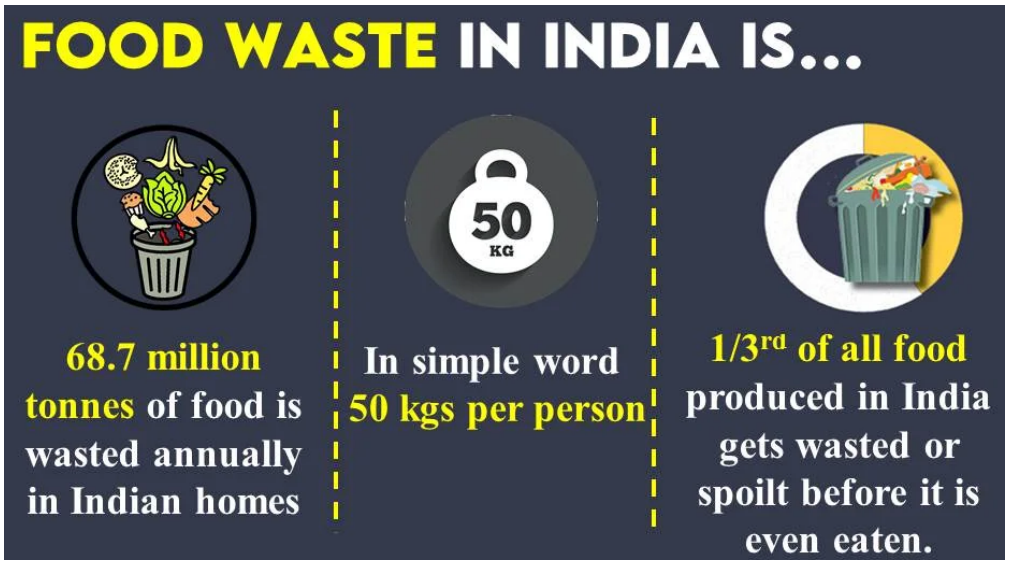


What are the opportunities in biofuel production for India?

- **Agricultural production** - India's agricultural abundance positions it as a natural leader in biofuel production.

  Total food grain and horticulture production in 2023-24 period were about 320 million tonnes and 350 million tonnes.

- **Sugarmills** - India's sugar mills, with their vast bagasse by-products, are uniquely positioned to drive this forward.
- By integrating bio-methanation with sugar mill operations, waste can be transformed into valuable energy.
- **Waste management** - 68.7 million tonnes of food is wasted annually in Indian homes.



- **Post harvest losses** - 22% of the foodgrain output or 10% of the total foodgrain and horticulture production for the 2022-23 period were lost.
- **Preharvest losses** – Crop losses due natural calamities like heavy rainfall, flood and cyclone can be used as feedstock in 2nd generation biofuel production.
- **Plastic management** – Developing bioplastics using bioplastics reduces plastic dependency and help in achieving sustainable material production.

What lies ahead?

- With global biofuel production projected to rise significantly by 2027 (as per IEA reports), India's multi-feedstock strategy must emphasise regional adaptability and waste valorisation.
- Technology adoption in biofuel production must ensure scalability and cost-efficiency.
- Global reports like GBET 2022 emphasize the need for biomass pretreatment and advanced bioconversion methods, which India must prioritize.
- India must diversify biofuel products to expand beyond ethanol into chemicals, SAF, and renewable materials to harness the opportunities from evolving global biofuel markets.
- With the aviation sector eyeing biofuels as a compliance mechanism for climate commitments, India must position itself as a key SAF supplier.

Reference

BusinessLine | The F-T-P approach