Ethanol Blending Beyond E20 – Issues and Challenges

Mains: *GS III – Energy| GS III – Environment*

Why in News?

The government of India is now exploring higher blends such as E25 and the introduction of E85 fuel for flex-fuel vehicles.

What is the background of Ethanol Blending Programme(EBP)?

- **Ethanol** – It is an alcohol-based biofuel produced primarily from *sugarcane, maize, and other biomass.*
- **EBP** – Under the Ethanol Blended Petrol (EBP) Programme, petrol is mixed with ethanol to reduce fossil fuel consumption.
- The *National Policy on Biofuels (2009)* initially envisioned achieving 20% ethanol blending by 2017.
- However, supply constraints delayed implementation.
- **Target achieved** – The present government accelerated the programme, enabling nationwide E20 availability well before the revised target of 2030.
- **Future plans** – The next phase includes, Increasing ethanol content from E20 to E25.
- Introducing *E85 fuel (85% ethanol and 15% petrol)* for flex-fuel vehicles.
- Encouraging development of engines optimized for higher ethanol blends.

Why is the government promoting higher ethanol blends?

- **Enhancing Energy Security –** India imports nearly 85% of its crude oil requirements.
- Higher ethanol blending reduces dependence on imported petroleum, thereby improving energy security and reducing vulnerability to geopolitical disruptions, especially in West Asia.
- **Reducing Carbon Emissions –** Ethanol contains fewer carbon atoms than petrol and burns more cleanly.
- Increased blending lowers greenhouse gas emissions and contributes to India's commitments under the Paris Climate Agreement and its Net Zero targets.
- **Supporting Farmers –** The ethanol programme creates a stable market for sugarcane, maize, and other feedstocks.
- It helps absorb surplus agricultural production and provides an additional income stream to farmers, particularly in states such as Maharashtra and Uttar Pradesh.
- **Lowering Foreign Exchange Outgo –** Reduced crude oil imports save valuable foreign exchange, improving India's trade balance and reducing exposure to fluctuations in international oil prices.

- **Boosting the Biofuel Economy –** The programme encourages investment in ethanol production, rural industries, and associated infrastructure, generating employment and supporting the transition towards a bio-based economy.
- **Scientific Advantages of Ethanol –** Ethanol possesses several desirable fuel characteristics:
- It has *a high octane rating (approximately 108 RON),* enabling cleaner combustion.
- It improves anti-knock performance in high-compression engines.
- Its high latent heat of vaporisation provides cooling benefits, improving engine performance.
- It has the potential to reduce harmful vehicular emissions.
- These characteristics make ethanol particularly suitable for modern high-performance and turbocharged engines designed specifically for higher ethanol blends.

What are the challenges associated with higher ethanol blending?

- **Reduced Fuel Economy –** The primary concern for Indian consumers is lower mileage.
- Ethanol has approximately *30% lower calorific value than petrol,* implying that higher ethanol blends deliver lower energy per litre. Consequently, vehicles not specifically engineered for E20 or higher blends experience noticeable reductions in fuel economy.
- Since Indian consumers traditionally prioritise mileage, this has emerged as the biggest source of dissatisfaction.
- **Compatibility with Older Vehicles –** Many vehicles manufactured before E20-compatible standards were introduced were originally designed for E10 fuel.
- Higher ethanol concentrations may affect, Fuel pumps, Rubber seals, Plastic components, Fuel lines, Valves and Piston assemblies.
- Although laboratory studies have shown limited corrosion in many materials, long-term real-world effects on older vehicles remain insufficiently documented.
- **Hygroscopic Nature of Ethanol –** ethanol readily absorbs moisture from the atmosphere.
- Water absorption can potentially, promote corrosion in metallic components
- Affect fuel stability, and lead to degradation of certain rubber and plastic materials.
- While manufacturers suggest that risks are manageable, apprehensions among vehicle owners continue.
- **Cold Starting Problems –** Ethanol burns at a higher temperature than petrol and evaporates differently, making cold starts more difficult, particularly during winter in certain regions.
- **Increased Manufacturing Costs –** Transitioning from e20 to e25 requires, fresh engine calibration, durability testing, material compatibility validation, and new homologation and emission certification
- These additional engineering requirements are likely to increase vehicle prices, with consumers ultimately bearing the additional cost.
- **Consumer Concerns –** A major criticism of india's ethanol policy is that consumers have had little choice.
- Unlike Brazil, Indian motorists generally receive only e20 petrol at fuel stations without an option to purchase lower ethanol blends.
- Further concerns include, lower mileage without any reduction in fuel prices, lack of

compensation for increased fuel consumption.
- Limited public awareness regarding vehicle compatibility, and concerns over maintenance costs for older vehicles.
- As a result, many motorists perceive themselves as bearing the costs of achieving national energy goals.

What are the lessons from Brazil?

- **Consumer Choice –** Fuel stations offer multiple fuel options, including blended petrol and pure ethanol.
- **Price Incentives –** Higher ethanol blends are sold at significantly lower prices, making them economically attractive despite lower mileage.
- **Flex-Fuel Vehicles –** Most vehicles are designed to run on varying ethanol-petrol combinations, allowing consumers to choose whichever fuel is more economical.
- **Long-Term Policy Stability –** Brazil's transition occurred gradually over several decades through coordinated government support, industry participation, and consumer awareness campaigns.
- The Brazilian experience demonstrates that successful ethanol adoption requires technological readiness, pricing incentives, and informed consumer choice.

Brazil *offers one of the world's most successful ethanol blending models.*

What could be done?

- Introduce differential pricing so that higher ethanol blends remain economically attractive.
- Offer multiple fuel options at retail outlets wherever feasible.
- Ensure adequate transition periods before moving beyond E20.
- Conduct independent long-term studies on impacts on older vehicles.
- Promote flex-fuel vehicle manufacturing through fiscal incentives.
- Strengthen public awareness regarding vehicle compatibility and maintenance.
- Expand second-generation ethanol production using agricultural residues to avoid excessive dependence on sugarcane.
- Develop a robust regulatory framework for quality control and fuel distribution.

What lies ahead?

- India's ethanol blending programme represents an important pillar of the country's energy transition strategy, offering substantial benefits in terms of energy security, reduced oil imports, lower emissions, and enhanced rural incomes.
- However, the rapid shift to E20 has exposed significant concerns relating to mileage loss, consumer costs, and compatibility of older vehicles.
- As India considers moving towards E25 and higher blends, policy implementation must balance environmental objectives with technological preparedness and consumer interests.
- Drawing lessons from Brazil, India should combine gradual implementation, competitive pricing, consumer choice, and robust public communication to ensure that

the transition to cleaner fuels remains both economically viable and socially acceptable.
- A carefully calibrated approach will enable India to achieve its sustainability goals without disproportionately burdening motorists.

Reference

The Indian Express| E2o and Beyond