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News: Ethanol

- Recently, **India has achieved higher ethanol production from grains**, particularly maize, surpassing that from sugar-based feedstock.

Ethanol

- Ethanol also known as **ethyl alcohol** is a biofuel produced from various sources such as sugarcane, corn, rice, wheat, and biomass.
- Molasses, a **byproduct of sugar manufacture**, are generally the main source of production of ethanol (anhydrous alcohol) and rectified spirit.

Molasses can be categorised into following:

- **A Molasses (First Molasses):** An **intermediate by-product from initial sugar crystal extraction**, containing 80-85% dry matter (DM).
- **B Molasses (Second Molasses):** **Similar DM content as first molasses but with less sugar** and no spontaneous crystallization.
- **C Molasses (Final Molasses, Blackstrap Molasses, Treacle):** **The end by-product of sugar processing**, containing significant amounts of sucrose (about

32 to 42%). It does not crystallize and is used as a commercial feed ingredient in liquid or dried form.

- The production process involves the fermentation of sugars by yeasts or via petrochemical processes such as ethylene hydration.
- Ethanol is 99.9% pure alcohol that can be blended with petrol to create a cleaner fuel alternative.

Properties of Ethanol

- Ethanol is a clear, colorless liquid with a characteristic wine-like odor and pungent taste.
- It is fully soluble in water and most organic solvents.
- In its pure form, it has a boiling point of 78.37 degrees Celsius and a melting point of -114.14 degrees Celsius.
- Ethanol is a combustible material and has a lower combustion temperature than gasoline, making it a cleaner-burning alternative.

Applications of Ethanol

- **Beverages:** Ethanol is the type of alcohol found in alcoholic beverages. It is consumed socially in various forms, such as beer, wine, and spirits.

- **Industrial Solvent:** Due to its ability to dissolve a wide range of substances, ethanol is used as a solvent in the manufacturing of pharmaceuticals, perfumes, and other products.
- **Medical and Laboratory Uses:** Ethanol is used as an antiseptic, disinfectant, and preservative in medical and laboratory settings.
- **Chemical Feedstock:** It serves as a feedstock for the production of various chemicals.
- **Fuel:** It is used as a biofuel and is often mixed with gasoline to produce ethanol-blended fuels.

Biofuels

- Any hydrocarbon fuel that is produced from an organic matter (living or once lived) in a short period of time (days, weeks or within months) is considered a Biofuel.
- It may be solid (Wood, Dried plant material & manure), liquid (Bioethanol & Biodiesel) or gaseous (Biogas) in nature.
- It can be used as a replacement or used in addition to fossil fuels for transportation, or generation of heat & electricity.

- Some reasons to shifting towards biofuel are the **rise in oil price, Global warming** caused by fossil fuels & **for the increase in income of farmers** (Doubling Farmers Income by 2022).

Categories of Biofuels

First generation

- **Made from food sources** such as sugar, starch, vegetable oil using conventional technology.
- Common first-gen biofuels include **Bio-alcohols, Biodiesel, and Vegetable Oils & Biogas**.
- Though the **process of conversion from source to biofuel is easy**, it **creates an imbalance in food supply chain & may leads to food shortage & hunger**.

Second generation

- These are **fuels made up of non-edible portions of crops** such as stems, husks, fruit skins & peelings.
- **Thermochemical & Biochemical conversion process** is used in producing such fuels.
- Examples include ethanol & biodiesel.
- **GHG emission of 2nd generation biofuel is less than that of 1st generation**.

Third generation

- These are produced from micro-organisms like algae.
- They can be grown in land & water unusable for food production, thereby reducing the stress on agricultural land.
- The fertilizers used in the production cause environmental pollution.
- Example of 3rd generation biofuels is Butanol.

Fourth generation

- In the production of these fuels, crops that are genetically engineered take in high amounts of carbon & harvested as biomass.
- Crops are then converted to fuel using 2nd generation techniques.
- The fuel is pre-combusted, and the carbon is captured. Then the carbon is geo-sequestered, meaning that the carbon is stored in depleted oil or gas fields or in unmineable coal seams.
- Some of these fuels are considered carbon negative as their production pulls out carbon from environment.
- Recently, National Biofuel Coordination Committee chaired by Union minister of Petroleum & Natural gas decided to use “surplus” rice available with Food Corporation of India (FCI) for conversion to ethanol.

- The objective of this decision is to **make alcohol-based hand-sanitizers and blend ethanol with petrol.**
- The decision will **affect millions of people who are already striving off Food insecurity.**
- Global Hunger Index rank of India is 111.

National Policy on Biofuels

- The National Policy on Biofuels categorises biofuels as **"Basic Biofuels" viz. First Generation (1G) bioethanol & biodiesel and "Advanced Biofuels" - Second Generation (2G) ethanol, Municipal Solid Waste (MSW) to drop-in fuels, Third Generation (3G) biofuels, bio-CNG etc. to enable extension of appropriate financial and fiscal incentives under each category.**
- The Policy **expands the scope of raw material for ethanol production by allowing use of Sugarcane Juice, Sugar containing materials like Sugar Beet, Sweet Sorghum, Starch containing materials like Corn, Cassava, Damaged food grains like wheat, broken rice, Rotten Potatoes, unfit for human consumption for ethanol production.**

- Farmers are at a risk of not getting an appropriate price for their produce during the surplus production phase. Taking this into account, the Policy **allows use of surplus food grains for production of ethanol for blending with petrol with the approval of National Biofuel Coordination Committee.**
- With a thrust on Advanced Biofuels, the **Policy indicates a viability gap funding scheme for 2G ethanol Bio refineries of Rs.5000 crore in 6 years in addition to additional tax incentives, higher purchase price as compared to 1G biofuels.**
- The **Policy encourages setting up of supply chain mechanisms for biodiesel production from non-edible oilseeds, Used Cooking Oil, short gestation crops.**
- The roles and responsibilities of all the concerned Ministries/Departments with respect to biofuels have been captured in the Policy document to synergize efforts.

Advantages

- Reducing import dependency.
- Cleaner environment
- Health benefits
- Employment Generation & DFI initiative.

- The policy envisages an indicative **target of 20% blending of ethanol in petrol & 5% blending of biodiesel in diesel by 2030** (Recently, government of India advanced this to 2025 from 2030). Currently the percentage stands at 2% for petrol & 0.1% for diesel.

News: International North-South Transport Corridor (INSTC)

- Recently, Russia has sent two trains carrying coal to India through the International North-South Transport Corridor (INSTC) for the first time.
- The consignment will travel over 7,200km from St. Petersburg, Russia to Mumbai port via Bandar Abbas port of Iran.

International North – South Transport Corridor

(INSTC)

- International North – South Transport Corridor (INSTC) is a **7,200km long multi-modal corridor to increase Trade between India and Russia.**
- It **connects ship, rail, and road routes for moving cargo between India, Iran, Azerbaijan, Russia, Central Asia, and Europe.**
- Earlier, the trade was conducted **through the Suez Canal.**
- The **time taken and costs for transportation would be reduced** by this new corridor.

- Also, it will increase connectivity between major cities like Mumbai, Moscow, Astrakhan (Russia), Baku (Azerbaijan), Tehran, Bandar Abbas and Bandar Anzail (all located in Iran).
- The agreement for the INSTC was signed by India, Iran and Russia in 2002 at the Euro–Asian Conference on Transport for promoting transportation cooperation among the Member States.
- It aimed to link India and Iran via sea route and then through Iran to the Caspian Sea onwards to Central Asia.
- Countries participating in the Project are India, Iran, Russia, Afghanistan, Azerbaijan, Armenia, Kazakhstan, Belarus, Tajikistan, Kyrgyzstan, Oman, Turkey, Syria, Uzbekistan and Ukraine.
- Bulgaria is an observer state.

Routes and Modes

- **Central Corridor:** The Central Corridor begins from the Jawaharlal Nehru Port in Mumbai and connects to the Bandar Abbas port (Iran) on the Strait of Hormuz. It then passes through the Iranian territory via Nowshahr, Amirabad, and Bandar-e-Anzali, runs along the Caspian Sea to reach the Olya and Astrakhan Ports in Russia.

- **Western Corridor:** The Western corridor connects the railway network of Azerbaijan to that of Iran via the cross-border nodal points of Astara (Azerbaijan) and Astara (Iran) and further to Jawaharlal Nehru port in India via sea route.
- **Eastern Corridor:** The Eastern Corridor connects Russia to India through the Central Asian countries of Kazakhstan, Uzbekistan, and Turkmenistan.

Significance

Diversification of Trade Routes

- INSTC allows India to bypass chokepoints like the Strait of Hormuz and the Red Sea (Suez Canal route), making its trade more secure.
- The Israel-Hamas conflict and the Houthi attacks on ships in the southern Red Sea have highlighted the significance of having alternative trade routes.
- Through this India can bypass Pakistan and unstable Afghanistan to reach Central Asia.

Enhanced Connectivity with Central Asia

- INSTC connects India to markets in Russia, the Caucasus, and Eastern Europe, facilitating trade, energy cooperation, defense, counterterrorism, and cultural

exchanges with Central Asian Republics through initiatives like “Connect Central Asia”.

- The INSTC significantly reduces transit time by 20 days and freight costs by 30% compared to the Suez Canal route.

Energy Security

- The INSTC facilitates India's access to energy resources in Russia and Central Asia and can reduce reliance on the Middle East.
- Since the Russia-Ukraine war, imports of metallurgical coal from Russia have tripled, and are expected to grow amid declining imports from Australia.

Strengthening Ties with Iran and Afghanistan

- India has invested in the Chabahar Port in Iran's Sistan-Balochistan province and signed an agreement for the INSTC, aiming to facilitate trade with Central Asian countries.
- Chabahar Port is essential for India, Iran, and Afghanistan as it offers direct sea access and trade opportunities in the region.

Challenges Related to Full Utilization of INSTC

Limited International Funding

- Unlike China's Belt and Road Initiative (BRI) with its dedicated funding institutions, INSTC lacks significant financial funding from major institutions like the World Bank and Asian Development Bank.

US Sanctions on Iran

- The harsh sanctions imposed on Iran after the US's withdrawal from the JCPOA (Joint Comprehensive Plan of Action) in 2018 resulted in many global companies withdrawing from infrastructure projects in Iran.

Security Concerns in Central Asia

- The presence of terrorist organizations like the Islamic State (IS) in Central Asia poses a significant security threat along the corridor which can deter investment and smooth operation of the route.

Differential Tariffs and Customs

- Disparities in customs regulations and tariff structures across member states create complexities and delays for cargo movement.

Uneven Infrastructure Development

- The corridor utilizes various modes of transport (ship, rail, road). Uneven infrastructure development across member states, particularly underdeveloped rail networks in Iran, creates bottlenecks and hinders the seamless movement of goods.
- There is a lack of a joint work plan for developing the corridor and its business ecosystem.

