

ENVIRONMENT

❖ **Understanding ethanol blending**

❖ **CONTEXT:** Prime Minister announced that India has achieved its target of blending 10% sugarcane-extracted ethanol in petrol, ahead of schedule. Addressing the nation from the Red Fort on the 76th Independence Day, he rooted for energy independence stating that, “we need to be Aatmanirbhar (self-sufficient) in our energy sector”. India is one of the world’s biggest oil importing nations.

❖ **What is ethanol blending?**

- Blending ethanol with petrol to burn less fossil fuel while running vehicles is called ethanol blending. Ethanol is an agricultural by-product which is mainly obtained from the processing of sugar from sugarcane, but also from other sources such as rice husk or maize.
- Currently, 10% of the petrol that powers your vehicle is ethanol. Though India have had an E10 — or 10% ethanol as policy for a while, it is only this year that India have achieved that proportion. India’s aim is to increase this ratio to 20% originally by 2030 but in 2021, when NITI Aayog put out the ethanol roadmap, that deadline was advanced to 2025.
- Ethanol blending will help bring down share of oil imports (almost 85%) on which it can spend a considerable amount of our precious foreign exchange. Secondly, more ethanol output would help increase farmers’ incomes.
- The NITI Aayog report of June 2021 says, “India’s net import of petroleum was 185 million tonnes at a cost of \$55 billion in 2020-21,” and that a successful ethanol blending programme can save the country \$4 billion per annum.

❖ **What are first generation and second generation ethanols?**

- With an aim to augment ethanol supplies, the government has allowed procurement of ethanol produced from other sources besides molasses — which is first generation ethanol or 1G. Other than molasses, ethanol can be extracted from materials such as rice straw, wheat straw, corn cobs, corn stover, bagasse, bamboo and woody biomass, which are second generation ethanol sources or 2G.
- It will not only the prospect of higher farmer income but also dwelt upon the advantages of farmers selling the residual stubble — left behind after rice is harvested — to help make biofuels. This means lesser stubble burning and therefore, lesser air pollution.

❖ **How have other countries fared?**

- Though the U.S., China, Canada and Brazil all have ethanol blending programmes, as a developing country, Brazil stands out. It had legislated that the ethanol content in petrol should be in the 18-27.5% range, and it finally touched the 27% target in 2021.

❖ **How does it impact the auto industry?**

- At the time of the NITI Aayog report in June 2021, the industry had committed to the government to make all vehicles E20 material compliant by 2023. This meant that the petrol points, plastics, rubber, steel and other components in vehicles would need to be compliant to hold/store fuel that is 20% ethanol. Without such a change, rusting is an obvious impediment.
- According to automobile manufacturer that the industry has committed to becoming E20 engine compliant by 2025, which means that engines would need to be tweaked so as to process petrol which has been blended with 20% ethanol.

❖ **Are there other alternatives?**

- Sources in the auto industry state that they prefer the use of biofuels as the next step, compared to other options such as electric vehicles (EV), hydrogen power and compressed natural gas. This is mainly because biofuels demand the least incremental investment for manufacturers.
- Even though the industry is recovering from the economic losses bought on by the pandemic, it is bound to make some change to comply with India’s promise for net-zero emissions by 2070.

❖ **What are the challenges before the industry when it comes to 20% ethanol blended fuel?**

- The Niti Aayog report points out that the challenges before the industry are: “optimisation of engine for higher ethanol blends and the conduct of durability studies on engines and field trials before introducing E20 compliant vehicles.”
- The auto industry is in talks with the government to plan this transition. There are multiple issues at stake for this endeavour. Storage is going to be the main concern, for if E10 supply has to continue in tandem with E20 supply, storage would have to be separate which then raises costs.

❖ **What have been the objections against this transition?**

- Ethanol burns completely emitting nil carbon dioxide. By using the left-over residue from rice harvests to make ethanol, stubble burning will also reduce.
- The 2G ethanol project inaugurated recently will reduce greenhouse gases equivalent to about three lakh tonnes of CO₂ emissions per annum, which is the same as replacing almost 63,000 cars annually on our roads.
- However, it does not reduce the emission of another key pollutant — nitrous oxide.

❖ **Inefficient land use in ethanol production**

- Can use land far more efficiently by generating renewable power for EV batteries. For example, to match the annual travel distance of EVs recharged from one hectare generating solar energy, 187 hectares of maize-derived ethanol are required, even when one accounts for the losses from electricity transmission, battery charging and grid storage.
- The water needed to grow crops for ethanol is another debating point. For India, sugarcane is the cheapest source of ethanol. On average, a tonne of sugarcane can produce 100 kg of sugar and 70 litres of ethanol — meaning, a litre of ethanol from sugar requires 2,860 litres of water.
- There has been, therefore, a move toward waste-based extraction, such as through coarse grains. But supply may still be a problem, though the Niti Aayog report sounds sanguine on this count — “the roadmap estimates ethanol production from domestic grains will increase a whopping fourfold by 2025.”
- The abnormally wet monsoon seasons may have helped in recent years to raise grain output, but the recent analysis by the International Council on Clean Transportation (ICCT) is sceptical that those production increases can be sustained.
- Sugar cane would likely continue to be the primary source for ethanol even with the 12 planned farm waste — or 2G ethanol — distilleries. The first, inaugurated recently, has a capacity to produce 100 kilo litres a day, or 3.65 crore litres a year.
- The 2021 Ethanol Roadmap forecasts that an additional 800 crore litres of ethanol is needed annually to meet the target. It assuming the other 11 planned farm waste distilleries have similar rates of production, their combined input would barely produce 5% of the additional annual ethanol requirement.

❖ **What about food security concerns and global impact on India’s target**

- There are already indications that more sugarcane is being grown and that the Government of India encouraged more corn production at the India Maize Summit in May 2022, with its use for ethanol production cited as a reason for this push.
- As was evident in India’s wheat harvest earlier 2022, climate change-induced heatwaves are a worrying factor and can lead to lower-than-expected harvests with little notice.
- Global corn, or maize, production is down, and this adds an incentive for India to try and export more.
- In France, the corn harvest has dipped 19%, and reductions in forecast production have been seen for at least seven other countries in Europe.
- U.S. production expectations have also been revised slightly downward.
- The uncertainty about future production, India may not find it easy to simultaneously strengthen domestic food supply systems, set aside adequate stocks for lean years, maintain an export market for grains, and divert grain to ethanol at the expected rate in coming years, and this is an issue that warrants continued monitoring.

PRELIMS

1. Raksha Mantri hands over indigenously-developed equipment & systems to Indian Army

❖ **The details of the equipment and systems handed over to the Indian Army**

❖ **What is the F-INSAS system?**

- F-INSAS stands for Future Infantry Soldier As A System, a programme for infantry modernisation aimed at increasing the operational capability of the soldier. As part of the project, soldiers are being equipped with modern systems that are lightweight, all-weather-all-terrain, cost-effective and low maintenance.
- The full-gear of the F-INSAS system includes an AK-203 assault rifle, which is a Russian-origin gas-operated, magazine-fed, select-fire assault rifle. It has a range of 300 metre, and is being made at Korwa near Amethi in a Russia-India joint venture. A contract for over six lakh AK-203 rifles was signed in December 2021 between the Ministry of Defence and the Indo-Russian Rifles Private Limited (IRRPL).

- On the weaponry front, other than the AK-203, the F-INSAS includes a multi-mode hand grenade, which can be used in defensive and offensive modes.
- In defensive mode, the grenades are to be hurled when the thrower is in a shelter or have a cover, while the target is in the open and can be harmed by fragmentation. In the offensive mode, the grenades do not fragment and the adversary is harmed by the blast or is stunned. The weapon kit also has a multi-purpose knife for close quarters combat.
- Apart from this, the F-INSAS provides soldiers with ballistic helmets and ballistic goggles for protection against small projectiles and fragments, along with a bullet-proof vest. The helmet and the bullet-proof jacket are capable of protecting the soldier against 9 mm bullets and ammunition fired from AK-47 rifles. For target acquisition, the soldier has rifle-mounted holographic sight for fast and accurate aiming with a range of 200 metre. The helmet has a mounted night-vision device for operating in low-light conditions, and the option of installing a thermal imager sight. Thermal imagers covert infrared energy from objects into thermal images.
- The F-INSAS also comes with hands-free, secured advanced communications set for real-time exchange of information with the command post and fellow soldiers for enhanced situational awareness.
- Most importantly, all these items have been sourced from Defence Public Sector Undertakings, and private Indian industries. They have been indigenously designed by the Indian entities, including the DRDO and the ordnance factories ecosystem.
- ❖ **What is the F-INSAS modelled on?**
- Conceived in the 2000s, F-INSAS is one among many soldier modernisation programmes across the world. The US has Land Warrior, while the UK has FIST (Future Integrated Soldier Technology). According to estimates, over 20 armies around the world are following such programmes.
- The DRDO had conceptualised the F-INSAS (not to be confused with INSAS or Indian Small Arms System) in line with the targets of the Army's Infantry Soldier Modernisation Programme with an aim to optimise the soldier's performance across the full spectrum and duration of a military operation.
- DRDO scientists revealed that similar infantry modernisation programmes from the US, France, Germany and Israel were studied for the Indian project.
- The quality requirements for the project were set by the Army. Research and development efforts are still on to further finetune the F-INSAS for all types of conflict scenarios and terrains.
- ❖ **What are Nipun mines?**
- Nipun mines are indigenously designed and developed anti-personnel mines, termed by the DRDO as 'soft target blast munition'.
- These mines are meant to act as the first line of defence against infiltrators and enemy infantry. They have been developed with the efforts of Armament Research and Development Establishment, a Pune-based DRDO facility, and Indian industry.
- Anti-personnel mines are meant to be used against humans as against anti-tank mines that are aimed at heavy vehicles. They are smaller in size and can be deployed in large numbers. The Army has said that the mine will provide protection to the troops on the borders and is more potent and effective than the existing anti-personnel mine in its arsenal.
- ❖ **What is the Landing Craft Assault?**
- The Landing Craft Assault (LCA) is meant to serve as a replacement for the boats with limited capabilities currently in use in the Pangong Tso lake.
- The LCA, which has been indigenously developed by Goa-based Aquarius ShipYard Limited, is said to have better launch, speed and capacity to operate across water obstacles in eastern Ladakh. Similar vessels are already in operation in the Indian Navy.
- ❖ **Some other defence systems**
- Other than these systems and equipment, the Defence Minister also formally handed over to the Army a thermal imaging sight for T-90 tanks; hand held thermal imager; and frequency-hopping radio relay for tactical communication across much longer ranges.
- Further, Downlink Equipment with Recording Facility to help helicopters in surveillance missions was also handed over. Using this system, reconnaissance data is recorded and can be accessed only when the helicopter returns to the base.
- Some other defence systems included, Infantry Protected Mobility Vehicles; Quick Reaction Fighting Vehicles and Mini Remotely Piloted Aerial System surveillance, detection and reconnaissance at the infantry battalion and mechanised units level.

2. Postal Identification Number

- ❖ **CONTEXT:** The 75th Independence Day coincides with another milestone in the country's history — it was on August 15, 1972, that the Postal Index Number (PIN) was introduced in India. As the PIN code turns 50 on Monday, we look at its history and evolution.
- ❖ **Why was the PIN code introduced?**
 - According to the Department of Posts, there were 23,344 post offices, primarily in urban areas, in India at the time of Independence. But, the country was growing rapidly and the postal network had to keep pace.
 - The PIN code was meant to ease the process of mail sorting and delivery in a country where different places, often, have the same or similar names, and letters are written in a wide variety of languages.
- ❖ **How does the PIN code work?**
 - The PIN is made up of six digits. The first number indicates the postal region — Northern, Eastern, Western, Southern; and number 9, which signifies the Army Postal Service. The second number denotes a sub-region, and the third represents the sorting district. The remaining numbers narrow the geography further to the specific post office making the delivery.
- ❖ **Who was the person behind the initiative?**
 - The person behind the initiative was Shriram Bhikaji Velankar, additional secretary in the Union Ministry of Communications and a senior member of the Posts and Telegraphs Board.
 - Velankar was also a Sanskrit poet of eminence who had been conferred the President's Award for Sanskrit in 1996, three years before he died in Mumbai. Among Velankar's 105 books and plays in Sanskrit was the Viloma Kavya, which is considered a literary masterpiece because it comprises verses in praise of Lord Rama when read from one side and, when read backwards, it transformed into verses dedicated to Lord Krishna. Velankar had set up a cultural group in Mumbai, called the Dev Vani Mandiram, which worked to create awareness about Sanskrit in India and foreign countries. Velankar was also the chairman of the World Philatelic Exhibition, called Indipex, which was held in New Delhi in 1973 and featured 120 countries. He retired from his government service on December 31, 1973.
- ❖ **What are some parallel systems followed world over?**
 - Globally, in the US, the Zone Improvement Plan (ZIP) code was introduced July 1, 1963, under the aegis of the Postal Service Nationwide Improved Mail Service plan to improve the speed of mail delivery.
 - According to the Library of Congress, "Under the old system letters went through about 17 sorting stops – the new system was going to be considerably less time-consuming utilizing newer, more mechanical systems".
 - In the UK, the sorting of mail started getting mechanised in the mid-1960s. "The key to mechanisation is an alphanumeric postal code that provides for sorting by machine at every stage of handling, including the carrier's delivery route. The coding equipment translates the postal code into a pattern of dots by means of which machines can sort mail at eight times the speed of manual sorting.
 - Japan created its postal code address system in July 1968, and automatic postal code reader-sorters exist in major post offices of the country.
- ❖ **Is the PIN code still relevant?**
 - With the spread of the Internet, when people are sending fewer letters, it is easy to question the relevance of the PIN code.
 - But try to order a food delivery or a parcel over online shopping and the importance of Velankar's work in India will become evident.

ANSWER WRITTING

Q. How was India benefited from the contributions of Sir M.Visvesvaraya and Dr. M. S. Swaminathan in the fields of water engineering and agricultural science respectively?

The British rule in India neglected modernisation of Indian agriculture and little was done to improve irrigation system. After independence, India did not have enough to feed its burgeoning population and it was forced to subsist on "ship to mouth" existence.

At these junctures,two personalities-Sir M Visvesvaraya and MS Swaminathan- emerged who revolutionised their respective fields of knowledge, contributing enormously to India's development.

Sir M. Visvesvaraya's contribution in the field of water engineering

- He is remembered as India's most prolific civil engineer, dam builder, economist, statesman, and can be counted among the last century's foremost nation-builders.

- He played an instrumental role in the construction of the Krishna Raja Sagara Lake and dam in 1924. This dam not only became the main source of water for irrigation for the nearby areas, but is also the main source of drinking water for several cities.
- Visvesvaraya was, among other things, responsible for the building and consolidation of dams across the country. He invented the Block System -automated doors that close in the conditions of overflow, and also designed Hyderabad's flood management system.
- He is recognised for his brilliance and creativity in harnessing water resources, designing and constructing dams and bridges, and revolutionising the irrigation system in India.
- Due to his outstanding contribution to the society, Government of India conferred 'Bharat Ratna' on this legend in the year 1955.

Dr. M.S. Swaminathan's contribution to agriculture science

- A plant geneticist by training, Professor Swaminathan's contributions to the agricultural renaissance of India have led to his being widely referred to as the scientific leader of the green revolution movement.
- Recognized worldwide for his basic and applied research in genetics, cytogenetics, radiation and chemical mutagenesis, food and biodiversity conservation, he conceptualized ever-green revolution movement in agriculture.
- Swaminathan is the visionary who took India from the bondage of 'Ship to Mouth' existence to the freedom of 'Right to Food' through home grown food.
- Apart from serving as head of various national and international institutions, he headed the National Commission on Farmers (NCF) constituted in 2004 to address the nationwide calamity of farmer suicides in India.

India needs to adhere to the visions of these two men, especially when our agrarian challenges are mounting due to erratic rainfall, cycles of floods and droughts, unsustainable practices and other endemic issues.

MCQs

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

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

2. Which of the following statements is/ are correct regarding Ethanol Blending Programme (EBP)?

1. Ethanol is an example of 3rd generation biofuel.
2. Currently 10% ethanol can be blended with petrol under the programme.
3. Under Ethanol Blending Programme the procurement of ethanol produced from non-food feedstocks has been allowed.

Select the correct option using the code given below:

- a) 1 and 2 only **b) 2 and 3 only**
c) 1 and 3 only d) All of the above

3. Consider the following statements

1. First-generation biofuels are produced from crops directly from the fields, such as cereals, maize, sugar beet and cane, and rapeseed.
2. Second-generation biofuels are produced from residual and waste products from, for example rice straw, wheat straw, corn cobs, corn stover, bagasse, bamboo and woody biomass

Select the correct statement using the codes given below

- a) 1 only b) 2 only
c) Both 1 and 2 d) Neither 1 nor 2

4. Consider the following

- | | |
|-------------------|--------------------------------------|
| Defence equipment | Application |
| 1. F-INSAS | Programme for infantry modernization |

