You & Technology Sep-2021

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GOOD MORNING TIMES S&T

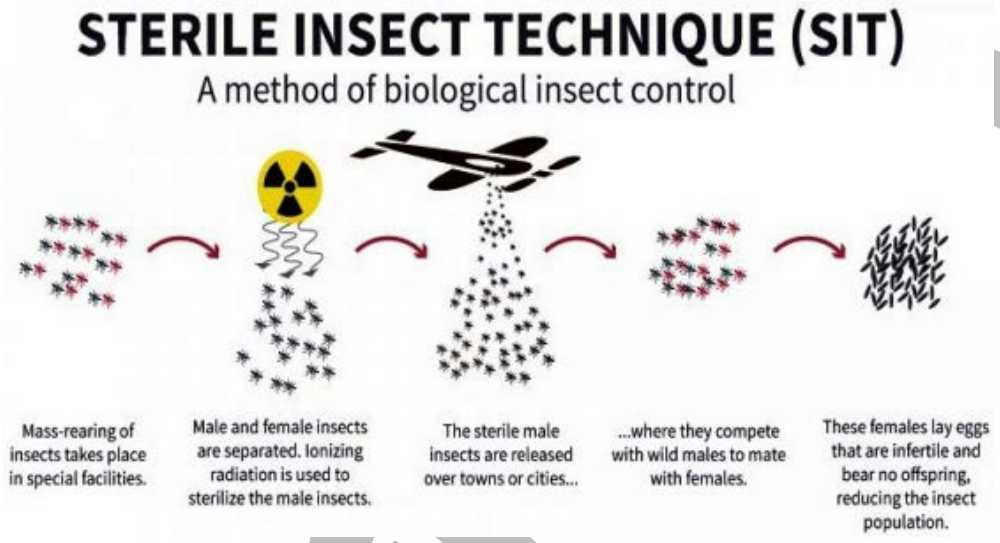
(SEPTEMBER-2021)

You & Technology Sep-2021

General Studies Paper-3 – S&T – Sep 2021

Restraining Mosquito Populations with CRISPR

- Researchers have created a system that restrains populations of mosquitoes by leveraging advancements in Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)-based genetic engineering.



- Sterile Insect Technique is an environmentally safe and proven technology to suppress wild populations.
- To further advance its utility, a novel CRISPR-based technology, termed precision-guided Sterile Insect Technique (pgSIT) is described.
- Males don't transmit diseases so the idea is to release more and more sterile males. It alters genes linked to male fertility—creating sterile offspring—and female flight in Aedes aegypti, the mosquito species responsible for spreading diseases including dengue fever, chikungunya and Zika
- Once the pgSIT eggs are released in the wild, sterile pgSIT males will emerge and eventually mate with females, driving down the wild population as needed
- pgSIT eggs can be shipped to a location threatened by mosquito-borne disease or developed at an on-site facility that could produce the eggs for nearby deployment

Robots in Warfare

- Israel Aerospace Industries unveiled a remote-controlled armed robot 'REX MKII'
- The robot can gather intelligence for ground troops, carry injured soldiers and supplies in and out of battle, and strike nearby targets
- The Israeli military is currently using a smaller but similar vehicle called the Jaguar to patrol the border with the Gaza Strip

Arguments in Favour of Use of Robots in War:

- No Physiological Limitations
- Operational Benefits to the Military
- Ability to Act Conservatively
- Minimising Loss of Human Life

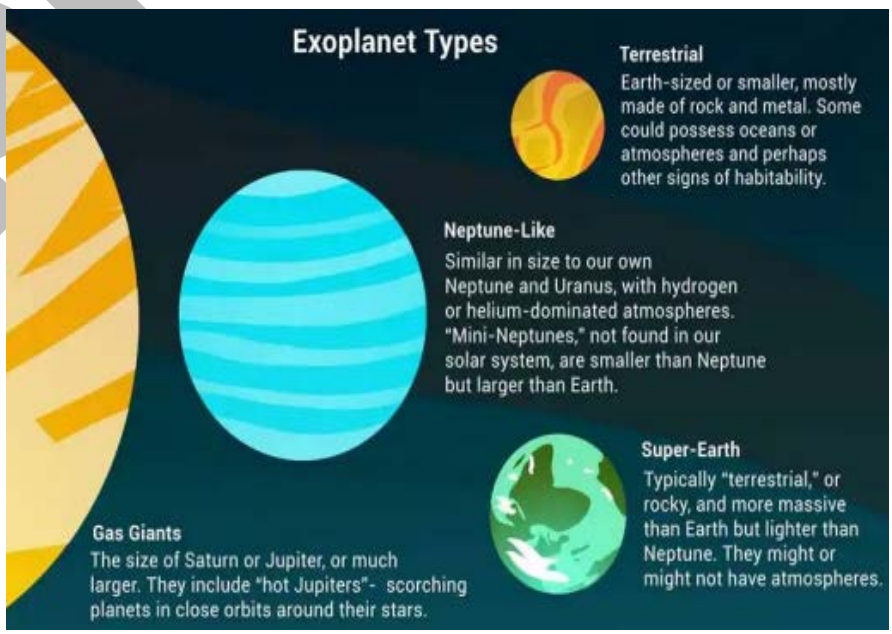
The Indian government has the Comprehensive Integrated Border Management System (CIBMS) project. The purpose is to integrate technology with the existing systems to facilitate better detection and interception by the man behind the machine

Blue Straggler Stars

- first-ever analysis of blue stragglers has been done and a new hypothesis proposed.
- Blue stragglers is a class of stars on open or globular clusters that stand out as they are bigger and bluer than the rest of the stars
- These are unusually hot and bright stars found in the cores of ancient star clusters known as globulars.
- The Milky Way's largest and brightest globular is Omega Centauri.
- Under standard stellar evolution, as time passes, each star evolves differently depending on its mass, in which all stars born at the same time should lie on a clearly defined curve in the Hertzsprung-Russell diagram
- Since blue stragglers often lie well off this curve, they may undergo abnormal stellar evolution.
- For this Hypothesis, the researchers utilised the Gaia telescope of the European Space Agency.

Hycean Worlds: Exoplanets

- Astronomers have identified a new class of exoplanets – Hycean worlds.
- The word Hycean comes from the words hydrogen and ocean. Planet-wide oceans and hydrogen-rich atmospheres might cover these worlds
- They are up to 2.6 times the diameter of Earth, with temperatures up to 200 degrees celsius and thick hydrogen atmospheres. This places them somewhere between Earth and giant planets like Neptune or Uranus.

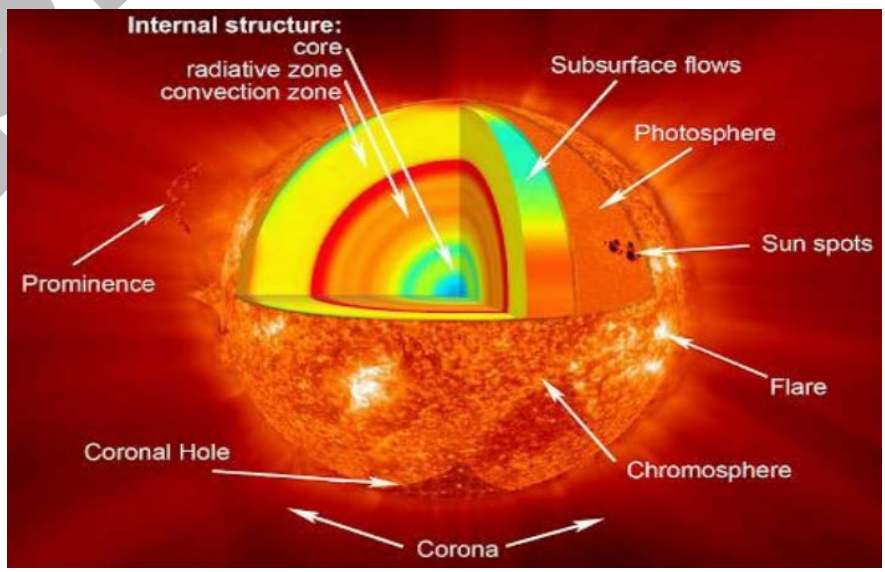


- These planets, unlike most mini-Neptunes, may have solid surfaces, like Earth.
- Some Hyceans orbit so close to their stars that they're tidally locked, with one hot dayside and one eternally dark nightside. Some Hyceans orbit so close to their stars that they're tidally locked, with one hot dayside and one eternally dark nightside.
- An exoplanet or extrasolar planet is a planet outside the Solar System. They are hidden by the bright glare of the stars they orbit.
- Hycean worlds could support life different from that on Earth.

Coronal Mass Ejections

- Coronal Mass Ejection (CME) is one of the biggest eruptions from the Sun's surface that can contain a billion tons of matter accelerated to several million miles per hour into space.
- Scientists) studied the weak thermal radio emission associated with the erupted plasma measuring the magnetic field and other physical conditions of the eruption
- Plasma is also known as the fourth state of matter. At high temperatures, electrons are ripped from atom's nuclei and become a plasma or an ionised state of matter.
- The underlying cause of CMEs is not well understood. Astronomers agree, however, that the sun's magnetic field plays a major role.
- Though CMEs can occur anywhere on the Sun, it is primarily those which originate from regions near the centre of the visible solar surface (called the photosphere)
- When a really strong CME blows past the Earth, it can damage the electronics in satellites and disrupt radio communication networks on Earth.
- When the plasma cloud hits our planet, a geomagnetic storm follow.
- They can trigger intense light in the sky on Earth, called auroras

Anatomy of the Sun



- The Sun's Core - Energy is generated via thermonuclear reactions creating extreme temperatures deep within the Sun's core.
- The Radiative Zone - Energy moves slowly outward, taking more than 1,70,000 years to radiate through this layer of the Sun.
- The Convection Zone - Energy continues to move toward the surface through convection currents of the heated and cooled gas

- The Chromosphere - This relatively thin layer of the Sun is sculpted by magnetic field lines that restrain the electrically charged solar plasma.
- The Corona - The ionized elements within the corona (or solar atmosphere) glow in the x-ray and extreme ultraviolet wavelengths. Space Instruments can image the Sun's corona at these higher energies since the photosphere (lowest layer of the solar atmosphere) is quite dim in these wavelengths
- Sunspots are areas that appear dark on the surface of the Sun. They appear dark because they are cooler than other parts of the Sun's surface

Engineer's Day

- Every year on 15th September, India along with Sri Lanka and Tanzania celebrate National Engineer's day to recognise and honour the achievements of the great engineer Mokshagundam Visvesvaraya.
- It is different from the World Engineers' Day celebrated annually by UNESCO on 4th March

About Mokshagundam Visvesvaraya:

- He was knighted as a Knight Commander of the British Indian Empire by King George V for his contributions to the public good in 1915.
- He was an Engineer who had planned the Indian Economy in 1934
- He was the chief engineer responsible for the construction of the Krishna Raja Sagara Dam in Mysore
- He was instrumental in designing and patenting a system of automatic weir floodgates in Khadakwasla reservoir in Pune in 1903.
- After the devastating floods (Musi River) in Hyderabad in 1908, he designed a drainage system to protect the city from these floods in the future
- He is the one who designed a plan for road construction between Tirumala & Tirupati.
- He played a key role in developing a system to protect Visakhapatnam port from sea erosion.
- He was responsible for founding the Mysore soap factory, the Mysore Iron & steel works (Bhadravathi), Sri Jayachamarajendra Polytechnic Institute, The Bangalore Agricultural University, and the State Bank of Mysore.
- Books Written by him- 'Reconstructing India' and 'Planned Economy of India'

C-295 Aircraft Deal

- The C-295MW aircraft will be purchased from Airbus Defence and Space S.A., Spain
- The C-295 MW is a transport aircraft of 5-10 tonne capacity with contemporary technology. It will be installed with the indigenous Electronic Warfare Suite
- It will replace the Indian Air Force's ageing fleet of Avro-748 planes. The Avro-748 planes are a British-origin twin-engine turboprop, military transport and freighter with a 6-tonne freight capacity.

- Airbus Defence and Space and Tata Advanced Systems Limited (TASL) will jointly execute the project to equip the air force with the new transport aircraft under the Make-in-India initiative in the aerospace sector

LCA-Mk2 and AMCA

- LCA-Mk2 is a 4.5 generation aircraft & is a replacement for the Mirage 2000 class of aircraft. It has got a bigger engine and can carry 6.5 tonnes of payload
- The LCA programme began in the 1980s to replace India's ageing MiG-21 fighters. The LCA is being designed and developed with ADA as the nodal agency and State-owned Hindustan Aeronautics Limited (HAL) being the principal partner.
- Aeronautical Development Agency (ADA) is an autonomous body of the Ministry of Defence.

Advanced Medium Combat Aircraft (AMCA):

- It is a fifth generation aircraft. And will be used by the Indian Air Force.
- It is a stealth aircraft, i.e. designed for stealth and unlike the LCA, which is designed for maneuverability
- It has two variants Mk-1 and Mk-2, While AMCA Mk-1 will have an imported engine, same as LCA Mk-2, the AMCA Mk-2 will have an indigenous engine.

Genes to Increase Grain Size of Sorghum

- Sorghum is a versatile grain crop used for human consumption, fodder and bioenergy generation.
- The grain is popular across the world because it has a low glycaemic index, is gluten-free and nutritious. The lower the glycemic index of a cereal, the lower is the relative rise in blood glucose level after two hours of consuming it.

Genes that can increase the grain size of sorghum have been discovered recently.

- The variety of the crop found in India is called jowar. It is said to have its origin in the country and is an important food and fodder crop.
- Sorghum plants are very hardy and can withstand high temperature and drought conditions. It is grown in areas that are too hot and dry for growing maize.
- Medium to deep black soils are predominantly suitable for growing sorghum with Maharashtra a leading producer.

Landsat 9

- NASA has launched an earth monitoring satellite called Landsat 9 from Vandenberg Space Force Base in California
- This satellite is referred to as NASA's' new eye in the sky' that will help study climate change
- The instruments aboard Landsat 9 are the Operational Land Imager 2 (OLI-2) and the Thermal Infrared Sensor 2 (TIRS-2)

Earth Observation Satellites of India

- e RESOURCESAT- 2, 2A, CARTOSAT-1, 2, 2A, 2B, RISAT-1 and 2, OCEANSAT-2, Megha-Tropiques, SARAL and SCATSAT-1, INSAT-3DR, 3D,
- Recently, India has launched EOS-01 satellite for applications in agriculture, forestry and disaster management support.
- Many earth observation satellites have been employed on sun-synchronous orbit.

Ammonium Nitrate Rules

- Ammonium Nitrate (NH4 NO3) is a nitrogen-rich white, crystalline chemical which is soluble in water.
- It is a common chemical ingredient of agricultural fertilisers.
- It is used as an ingredient for the production of anaesthetic gases and cold packs.
- It is also the main ingredient in the manufacture of commercial explosives used in mining and construction.
- It is the main component of the explosive composition known as ANFO- Ammonium Nitrate Fuel Oil. Many Improvised Explosive Devices (IEDs) used by terrorists around the world have ANFO as the main explosive.

Recently, the Government has amended the rules for Ammonium Nitrate to curb its pilferage, introduce fire-fighting provisions as well as improve ways to handle and store the chemical.

- The rules require that ammonium nitrate received at ports be transferred to storage houses 500 metres beyond the port area.
- The rules also permit the auction of seized lots of ammonium nitrate to ensure safe and speedy disposal besides requiring that Ammonium Nitrate be imported in bagged form only
- For the manufacture of ammonium nitrate, an Industrial licence is required under the Industrial Development and Regulation Act, 1951.

Herbicide Tolerant Rice Varieties

- The new varieties contain a mutated AcetoLactate Synthase (ALS) gene making it possible for farmers to spray Imazethapyr, a broad-spectrum herbicide, to control weeds.
- Imazethapyr, effective against a range of broadleaf, grassy and sedge weeds, can't be used on normal paddy, as the chemical does not distinguish between the crop and the invasive plants.
- Indian Agricultural Research Institute (IARI) has developed the country's first-ever non-GM herbicide-tolerant rice varieties (Pusa Basmati 1979 and Pusa Basmati 1985).
- There is no foreign gene involved in the process, the herbicidetolerance is through mutation breeding. Thus, it is not a Genetically modified organism.
- The new varieties simply replace water with Imazethapyr and there's no need for nursery, puddling, transplanting and flooding of fields.
- Water is a natural herbicide that takes care of weeds in the paddy crop's early-growth period.

The new varieties will help in Direct Seeding of Rice (DSR) which has several advantages over paddy transplantation

- In Paddy Transplantation ,The field where the seedlings are transplanted has to be "puddled" or tilled in standing water. Paddy transplantation is both labour- and waterintensive.
- In Direct Seeding of Rice, the pre-germinated seeds are directly drilled into the field by a tractor-powered machine. Farmers have to only level their land and give one pre-sowing irrigation.

Advantages with Direct Seeding of Rice:

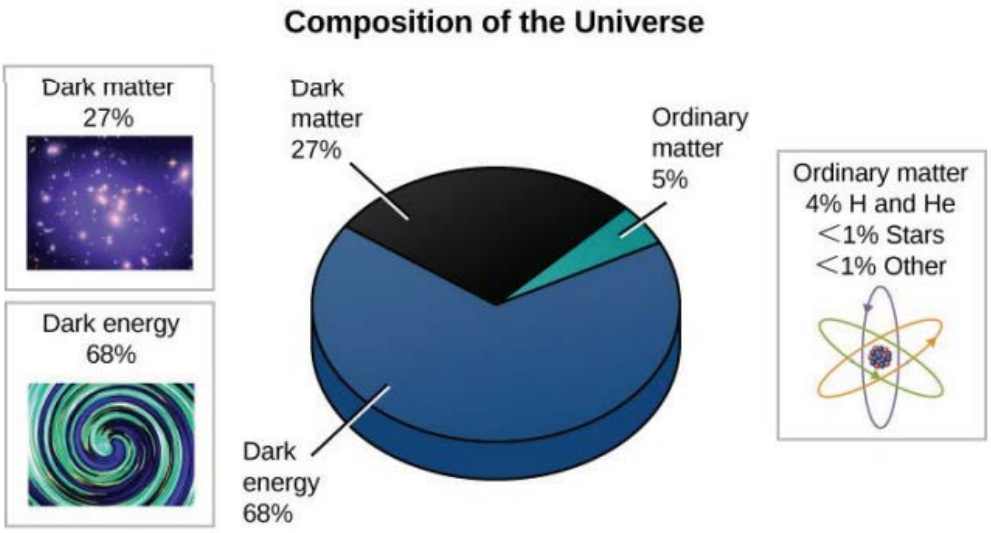
- Water savings.
- Less numbers of labourers required.
- Saves labour cost.
- Reduce methane emissions due to a shorter flooding period and decreased soil disturbance.

Drawbacks of Direct Seeding of Rice:

- The seed requirement for DSR is also high, 8-10 kg/acre, compared to 4-5 kg/acre in transplanting.
- Further, laser land levelling is compulsory in DSR. This is not so in transplanting.
- The sowing needs to be done timely so that the plants have come out properly before the monsoon rains arrive

Dark Energy

- The experiment named XENON1T, is the world's most sensitive dark matter experiment and was operated deep underground at the INFN Laboratori Nazionali del Gran Sasso in Italy.
- Dark energy is the mysterious form of energy that makes up about 68% of the universe.



- The experiments aim to detect particles in the form of Weakly Interacting Massive Particles (WIMPs) by looking for rare interactions via nuclear recoils in a liquid xenon target chamber
- While dark matter attracts and holds galaxies together, dark energy repels and causes the expansion of our universe

Possible Explanations of Dark Energy:

- One version of Einstein's gravity theory, the version that contains a cosmological constant, implies that "empty space" can possess its own energy.
- Another explanation for how space acquires energy comes from the quantum theory of matter. In this theory, "empty space" is actually full of temporary ("virtual") particles that continually form and then disappear.
- There are four fundamental forces in the universe, and speculative theories have proposed a fifth force – something that can't be explained by the four forces.
- However, none of the theories have been proved. Due to this, Dark energy has been noted as "the most profound mystery in all of science"

The Four Fundamental Forces of Nature are Gravitational force, Weak Nuclear force, Electromagnetic force and Strong Nuclear force

Solar DC Cooking System

- It is a Solar Energy based Cooking System which consists of a solar PV panel, charge controller, battery bank and cooking oven.
- It provides a Clean Cooking Environment, InvertorLess Direct Operation, Fast and Uniform Heating and a potential to save 1 ton Carbon Dioxide emissions per year/household
- It has 20-25% better efficiency and is more Economical in comparison with Conventional Solar based Cooking Systems
- Widespread usage the system can also play a critical role in achieving the target of 200 GW of Solar energy and also to save almost 290 million tons of Carbon Dioxide emissions
- Recently, the solar DC cooking technology was developed by the Central Mechanical Engineering Research Institute (CMERI) under CSIR.

Fundamental Force Particles

Force	Particles Experiencing	Force Carrier Particle	Range	Relative Strength*
Gravity acts between objects with mass	all particles with mass	graviton (not yet observed)	infinity	much weaker
Weak Force governs particle decay	quarks and leptons	W^+, W^-, Z^0 (W and Z)	short range	
Electromagnetism acts between electrically charged particles	electrically charged	γ (photon)	infinity	
Strong Force** binds quarks together	quarks and gluons	g (gluon)	short range	much stronger

Microchip: Smallest Man-Made Flying Structure

- Northwestern University (US) has created an Electronic Microchip or Microflier with the capability of flight. It is the smallest-ever human-made flying structure
- It is about the size of a grain of sand and does not have a motor or engine.

- It catches flight on the wind — much like a maple tree's propeller seed — and spins like a helicopter through the air toward the ground
- When dropped from a height it would fall at a slow velocity in a controlled manner. This behaviour increases the amount of time it interacts with the air.

Tarballs

- Tarballs are dark-coloured, sticky balls of oil that form when crude oil floats on the ocean surface. They are formed by weathering of crude oil in marine environments.
- Most of the time, the presence of several tarballs indicate an oil spill.
- Oil-well blowouts, accidental and deliberate release of bilge and ballast water from ships, river runoff, discharges through municipal sewage and industrial effluents also leads to the formation of tarballs.
- Tarballs are difficult to break down, and can therefore travel for hundreds of miles in the sea. Tarball pollution is a major concern to the global marine ecosystem.

INSPIRESAT-1 Cubesat Satellite

- It is a small scientific satellite which will be placed in a low earth orbit, equipped with a Compact Ionosphere Probe for studying the earth's ionosphere.
- It will also provide a greater understanding of why the Sun's corona is orders of magnitude hotter than the photosphere
- INSPIRE is a consortium of universities with active space programs, formed to advance space science and engineering.
- A constellation of earth and space-weather observation satellites is envisaged under the INSPIRE program which includes a series of INSPIRESats i:e INSPIRESat-1 to INSPIRESat-7

USE OF TECHNOLOGY IN AGRICULTURE

- India is the third-largest nation in terms of funding received and start-ups in the agritech space.

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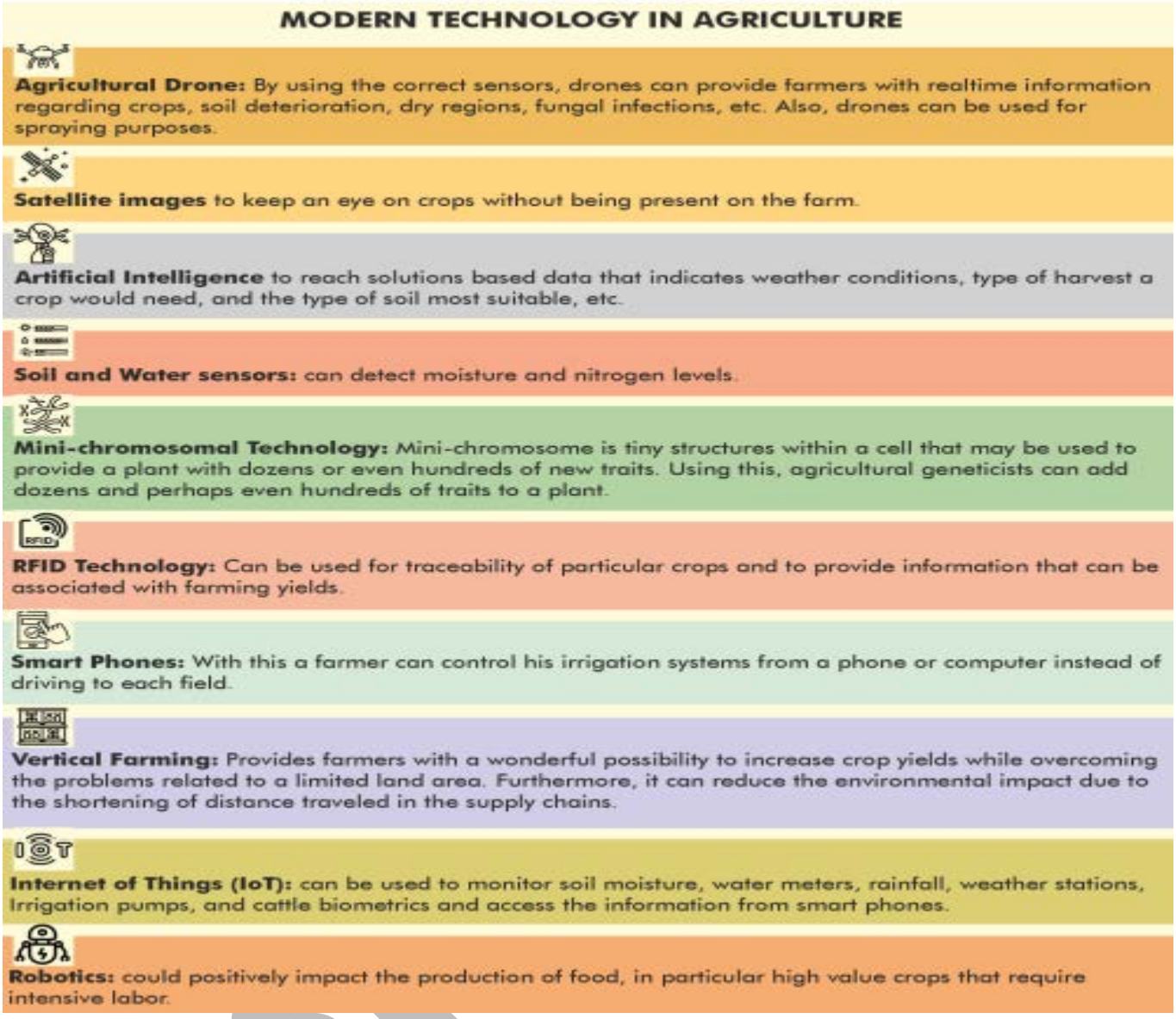


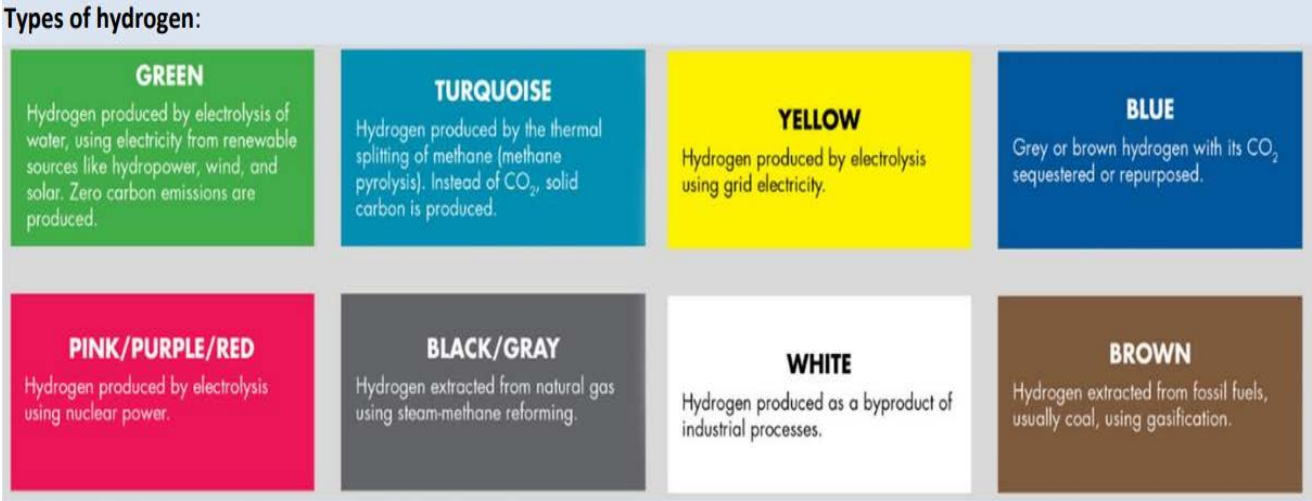
Advantage of using technology:

- Better crop varieties
- Improving productivity
- Environmental sustainability
- Lower cost of production
- Improving water use efficiency
- Improved decision making
- Climate/ weather prediction

COAL BASED HYDROGEN

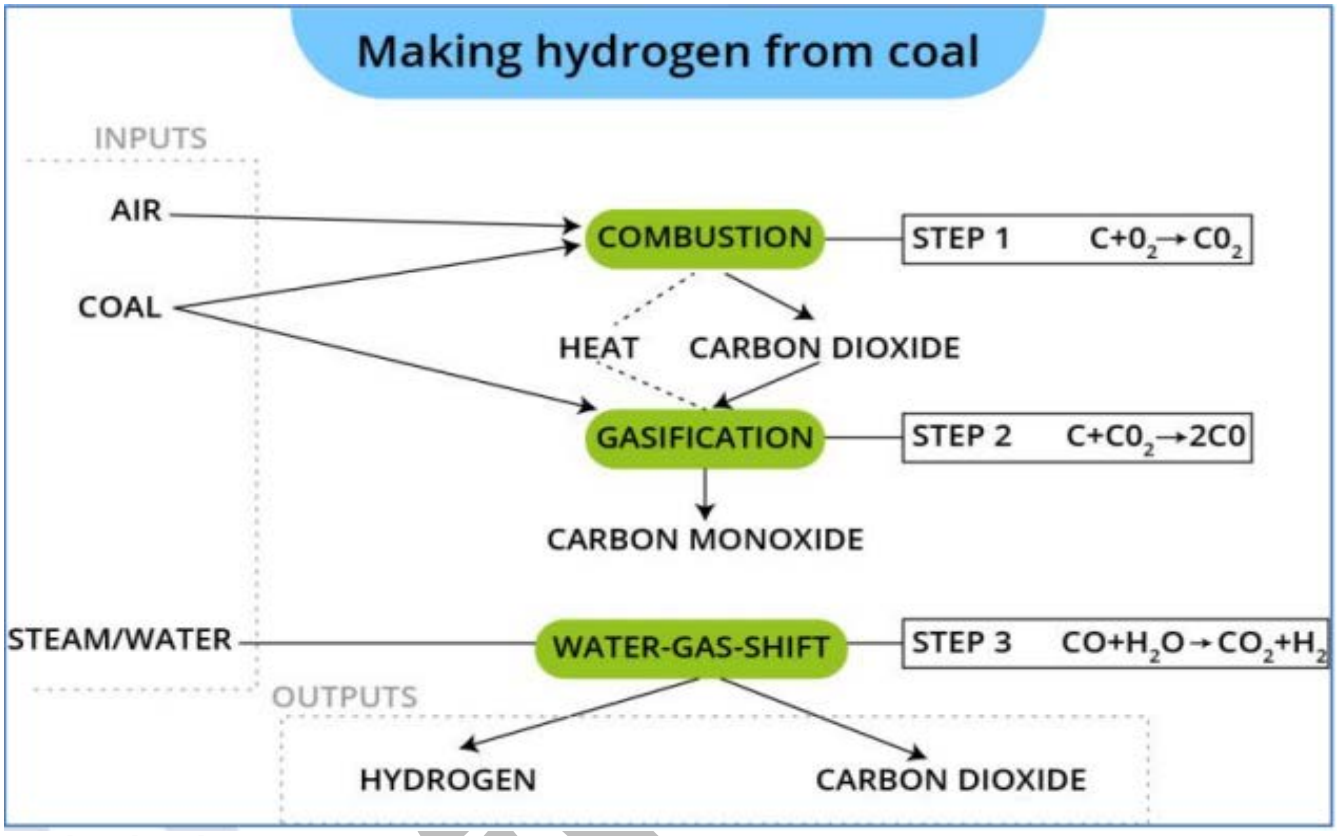
- Ministry of Coal constituted a Task Force and Expert Committee to prepare the roadmap for Coal based Hydrogen production.
- At present, the current global demand for hydrogen is 70 million metric tons, most of which is being produced from fossil fuels– 76% from natural gas and 23% from coal and remaining from the electrolysis of water.
- Much of the hydrogen produced is used for oil refining, ammonia, methanol production, steel production
- Coal is one of the important sources of hydrogen making (Brown Hydrogen) apart from Natural Gas (Grey hydrogen) and renewable energy (Green Hydrogen) through electrolysis.

How is Coal based Oxygen produced?



- The partial oxidation process is used to produce hydrogen from coal, which means some air is added to the coal, which generates carbon dioxide gas through traditional combustion.
- The partial oxidation also makes its own gasification agent, carbon dioxide.
- Carbon dioxide reacts with the rest of the carbon in the coal to form carbon monoxide (this is the endothermic gasification reaction, which needs heat input)

- Carbon monoxide in the gas stream is now further reacted with steam, generating hydrogen and carbon dioxide.



- Since India has the world's fourthlargest coal reserves, Cost of Hydrogen produced from coal can be cheaper and less sensitive to production through electrolysis and Natural Gas respectively
- As current technology hydrogen is made primarily from fossil fuel reformation, this would lead to a higher rate of carbon dioxide emissions.
- Coal has not been encouraged elsewhere because of the fear that while extracting hydrogen via coal (from the moisture embedded in coal) there may be carbon emission.

NATIONAL ACTION PLAN FOR DOG MEDIATED RABIES ELIMINATION (NAPRE) LAUNCHED

- Prepared by National Centre for Disease Control, NAPRE targets to end rabies by 2030 through One health Approach.
- Earlier, a National Rabies Control Program was launched during 12th Five-year Plan.
- Rabies is a vaccine-preventable, zoonotic, viral disease. Once clinical symptoms appear, rabies is virtually 100% fatal
- Rabies is present on all continents, except Antarctica.

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UNITED IN SCIENCE 2021 REPORT RELEASED

- Report is a multi-organization compilation (World Meteorological Organization; United Nations Environment Programme etc.) of the latest climate science information and gives a unified assessment of the state of Earth system.

Key highlights

- carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2 O) continued to increase in 2020 and the first half of 2021
- CO2 emissions have largely bounced back to prepandemic levels.
- Average global temperature for the past five years (2017–2021) was among the highest on record.
- An excess of 103 billion potential work hours were lost globally in 2019

STATE FOOD SAFETY INDEX (SFSI)

- The index was prepared by the Food Safety and Standards Authority of India (FSSAI) to galvanize States to work towards ensuring safe food for citizens.
- The index measures the performance of States across five parameters of food safety:
- Human Resources, Compliance, Food Testing- Infrastructure and Surveillance, Training and Capacity Building, Consumer Empowerment

Top states

- Large States: Gujarat
- Small States: Goa
- Union Territories: Jammu and Kashmir

Milky Sea Effect

- The Milky Sea effect refers to an unusual marine phenomenon in the ocean in which a large amount of sea water appears to glow brightly (eerie blue glow)at night
- Also called mareel, the milky sea is caused by bioluminescent bacteria, billions of trillions of them, that live throughout the water column from the surface to the sea floor.
- Some point out that Mareel is typically caused by Noctiluca scintillans (popularly known as “sea sparkle”), a dinoflagellate that glows when disturbed and is found in oceans throughout much of the world.
- Bioluminescent bacteria are light-producing bacteria that are predominantly present in sea water, marine sediments, the surface of decomposing fish and in the gut of marine animals.
- Stress, caused by the movement of the sea and waves, leads the plankton to emit light, or bioluminescence as a defence mechanism in a similar way to some fireflies.

Helina Missile

- The helicopter-launched Nag Anti-Tank Guided Missile (ATGM), Helina, being developed indigenously, has completed all trials.
- Helina is a third-generation, Lock on Before Launch (LOBL) fire and forget class anti-tank guided missile (ATGM) system.
- Nag can be launched from land and air-based platforms. The land version is currently available for integration on the Nag missile carrier (NAMICA)

DRDO has developed nag Missiles under the Integrated Guided Missile Development Program.
The five missiles (P-A-T-N-A) developed under this program are:

- Prithvi: Short-range surface to surface ballistic missile.
- Agni: Ballistic missiles with different ranges, i.e., Agni (I, II, III, IV, V).
- Trishul: Short-range low-level surface to air missile.
- Nag: 3rd generation anti-tank missile.
- Akash: Medium range surface to air missile.

Global Innovation Index 2021

- India has climbed 2 spots and has been ranked 46th by the World Intellectual Property Organization in the Global Innovation Index 2021 rankings.
- India has been on a rising trajectory, over the past several years in the Global Innovation Index (GII), from a rank of 81 in 2015 to 46 in 2021.
- This year, a novel new feature, the Global Innovation Tracker, gives a snapshot on the pulse of global innovation, including throughout the Covid-19 pandemic.

Defence Acquisition Council (DAC)

- The Defence Acquisition Council (DAC), chaired by Defence Minister accorded approval to capital acquisition proposals of the three Services estimated at approximately Rs. 13,165 crore
- The Defence Acquisition Council (DAC) is the highest decision-making body in the Defence Ministry for deciding on new policies and capital acquisitions for the three services (Army, Navy and Air Force) and the Indian Coast Guard.
- The Minister of Defence is the Chairman of the Council. It was formed, after the Group of Ministers recommendations on 'Reforming the National Security System', in 2001, post Kargil War (1999).

Toxic material in firecrackers

Green Crackers and NGT - AspireIAS- Read here

Ayushman Bharat Digital Mission

- Recently launched.

- Will create a seamless online platform through the provision of a wide-range of data, information and infrastructure services, duly leveraging open, interoperable, standards-based digital systems while ensuring the security, confidentiality and privacy of health-related personal information.
- Enable access and exchange of longitudinal health records of citizens with their consent
- Create interoperability within the digital health ecosystem, similar to the role played by the Unified Payments Interface in revolutionizing payments.

Key components

- A health ID for every citizen that will also work as their health account, to which personal health records can be linked and viewed with the help of a mobile application
- A Healthcare Professionals Registry (HPR) and Healthcare Facilities Registries (HFR) that will act as a repository of all healthcare providers across both modern and traditional systems of medicine ensuring ease of doing business for doctors/hospitals and healthcare service providers.

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ASPIRE IAS UPCOMING EXCLUSIVE sessions FOR MAINS-2022 (Online & Offline)

1. Geography OPTIONAL and RRVAP (Rapid round value addition programme with TEST SERIES)

- For the last 5 years favourite programme among students.
- Where you are lacking we are working upon like, Paper-2 in contemporary and geographical manner, Mapping and its application, special emphasis on Thoughts-Regional planning and biogeography.
- Full coverage of geography with writing skill development
- 2013 when the average score was 140 in Geo our students scored 200+ (Isha Dhuna, Nitin Agarwal and Aditya uppal)
- 2014 when average score is 230 our students scored 280-300 (Aditya uppal RANK-19 309 marks)
- Same trend in 2015-18
- Starts after 7 days of PT examination

2. Our best and SUCCESS GRADE course Newspaper analysis and writing skill programme.

** Our TM and most successful programme start 7 days of PT exam with the coverage of last **3 years issues** highly helpful in P-2&3 (Seats are limited). *FOR FRESHERS AS WELL AS THOSE WHO WANT TO SCORE 450+ IN MAINS 2019*

3. Writing skill development, enhancement and management programme.

- Best developed programme to enhance the writing skills at individual level
- Yield a fantastic result: RANK-22 (Saloni Rai) and Rank 1 Nandani others….

33 sessions with same day discussion, feedback and evaluation of the copies.

4. Special batch for ETHICS and 150 CASE STUDIES. (15 days with the guidance to score 110+ by DIRECTOR sir)

5. Geography for GS MAINS

6. Sociology, political science and Public administration full course and crash course with writing skills.

7. Ncert Foundation btach.

8. Target-50 GS-FOUNDATION batch for 2022….

All the Best to all my Economics students…
Hope this material will help you.
God bless...JAI Hind

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All the Best
Jai Hind ☺