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Pangenome for Asian Rice

***Prelims**: Current events of national and international importance| Sustainable Development*

Why in news?

Recently scientists from China have assembled the first pangenome for Asian rice.

- **Pangenome** – It is a ***comprehensive genetic blueprint of a species*** that includes,
  - **Core genes,** which is common to all individuals in a species.
  - **Accessory or unique genes** present in some, but not all, varieties.
- It shows the ***complete genetic diversity*** within a species.
- **First pangenome of Asian rice –** It is created by analysing genomes from 144 varieties of wild and cultivated rice from Asia.
- **Evolutionary Findings** – The study reinforced the hypothesis that all Asian cultivated rice originated from a ***wild variety called Or-IIIa (ancestor of japonica).***
- Asian cultivated rice (Oryza sativa L.) was domesticated from its *wild progenitor O. rufipogon.*
- About ***20% of genes are unique to wild rice***, which has traits that can improve *resilience and yield*.

Significance

- **Crop Improvement** - It enables development of new rice cultivars with Higher yield, Drought and heat resistance, Disease and pest tolerance.
- **Climate Adaptation** - It helps address climate-related risks such as reduced productivity due to rising temperatures and arsenic uptake in rice grains.
- It is essential in countries like India, which is already witnessing a 0.7°C rise in average temperature since 1901.
- **Sustainable Agriculture** – The wild rice genes can improve environmental adaptability, regeneration potential, and Genetic diversity in modern rice breeding programs.
- ICAR recently announced development of two genome-edited rice varieties (Samba Mahsuri and MTU 1010) with higher yields and better drought resistance.
- The pangenomic data will ***accelerate India's efforts*** in crop biotechnology.

Reference

The Hindu| First Pangenome for Asian Rice

Asteroid YR4

***Prelims**: Current events of national and international importance| Indian Geography*

Why in news?

Recently NASA announced that there was a 3.8% chance Asteroid YR4 could collide with the moon on December 22, 2032.

- **Asteroid YR4** – It is a ***near-earth asteroid***, an object orbiting the sun whose closest approach to the star is within 1.3-times the earth-sun distance.

  Near-Earth asteroids (NEAs) are asteroids with orbits that bring them close to Earth, potentially crossing Earth's orbital path.

- Such asteroids are classified as potentially hazardous objects if their orbits cross the earth's and they are more than 140 m wide.
- **Discovery** – It was discovered in December 2024 using ATLAS telescope in Rio Hurtado, Chile.

  The ATLAS telescope is a NASA-funded asteroid detection system that scans the entire night sky every 24 hours for near-Earth objects (NEOs) with four telescopes now operating in Hawaii, Chile, and South Africa.

- **Physical characteristics** – Infrared observations from the James Webb Space Telescope have revealed a clearer picture of the asteroid's size.
- It is now estimated to be 65 m wide, about the size of a 10-storey building.
- For comparison, dinosaur-extinction asteroid was 10 km wide.
- **Earth Impact Assessment –** NASA initially predicted that the asteroid has 3.1% chance of hitting Earth in 2032.
- Later revised assessment that the chance of hitting Earth is actually negligible.
- **Moon Impact Possibility –** NASA now predicts that there is 3.8% chance of colliding with moon on December 22, 2032.
- If impact occurs, would create 500-2,000-meter-wide crater.
- Impact explosion would be 340 times more powerful than Hiroshima bomb.
- **Future monitoring -** YR4 will pass by Earth again in 2028 and this will provide opportunity to collect more data after four-year gap.
- It will provoide opportunity to acquire more data, with refined models, and develop a better picture of whether the asteroid might strike the moon.

Reference

The Hindu| Asteroid YR4

BrahMos Missile

***Prelims**: Current events of national and international importance| Security Issues*

Why in news?

Recently BrahMos missile was likely used in the precision strikes against Pakistan's military bases during Operation Sindoor on May 10.

- **BrahMos missile** – It is an ***unmanned*** payload rocket, which is equipped with a propulsion system, guidance system and a warhead.

- **Origin –** BrahMos is a joint venture between India's DRDO and Russia's NPO Mashinostroyenia (NPOM).
- It is named after the *Brahmaputra (India) and Moskva (Russia)* rivers.
- India holds 50.5% stake, Russia holds 49.5% stake and it is first successfully tested on June 12, 2001.

Technical Specifications

- It is a ***Supersonic cruise missile*** (3 times the speed of sound in cruise phase).
- It can take a trajectory from Low to high in a quick time period, and it is very difficult for any ship-based radar to detect.
- **Two-stage missile** - First stage is solid propellant booster engine which propels to supersonic speed, and it then gets separated.
- The second stage of the liquid ramjet then fires and thrusts the missile to three times the speed of sound in its cruise phase.

  Liquid ramjet is an air-breathing jet engine that uses liquid fuel, which is injected into high-speed airstream and ignited to produce thrust.

- **Fire and forget** - 'Fire and forget' missiles are guided weapons that require no further input or control after being launched.
- It can achieve cruising altitude of 15 kilometers and terminal altitude as low as 10

meters
- BrahMos is its extremely *low radar cross-section (RCS)* because of its compact design and use of special materials.

Low Radar Cross Section (RCS) refers to a design that minimizes an object's reflection ability, so that it cannot be detected by the Radars.

BrahMos variants

- **Navy variant** – It can be fired from moving/static naval platforms.
- **Land variant** – It can be launched from mobile autonomous launchers with 3 missiles per launcher.
- **Air variant** – It is carried by Sukhoi-30 MKI fighter jets.
- **Submarine variant** – It can be launched from 50 meters below water surface.
- **BrahMos-NG (Next Generation)** – It is under development with reduced dimensions and enhanced stealth.
- Recently the *BrahMos Aerospace facility* was inaugurated in Lucknow to produce the BRAHMOS-NG variant.

Strategic Importance

- It is considered as a versatile "***stand-off range weapon***" because they can be launched from a safe distance, keeping the attacker out of enemy defence range.
- It is superior than subsonic cruise missiles (Nirbhay) with high speed, flight range, and more kinetic energy.

Reference

The Indian Express| BrahMos missile

Most Favoured Nation

Prelims: *Economy| Current events of national and international importance.*

Why in News?

Recently, US signed an executive order to lower the prices of prescription drugs to bring drug prices in the US.

- **Most Favoured Nation** – It implies ***preferential terms of trade*** with respect to tariffs and trade barriers.
- **Legality** – Under Article 1 of the General Agreement on Tariffs and Trade (GATT), 1994, *every member country* of the World Trade Organization (WTO) must accord Most Favoured Nation (MFN) status to all other member countries.

*The **World Trade Organization (WTO)** is the successor of the erstwhile GATT, and is the world's largest intergovernmental trading body. It has 166 member nations, and represents 98% of the world's trade. Its stated goal is to open trade for the benefit of all.*

- **Regulation** – Under the WTO agreements, countries following the MFN status *cannot discriminate among their trading partners.*
- They *cannot grant one country "a special favour"* such a lower customs duty on one of their products, without extending the same to other WTO members.

Between 1996 and 2019, India accorded the Most Favoured Nation (MFN) status to Pakistan. This was revoked in February 2019 following Pakistan's terror attack on Pulwama in Jammu & Kashmir.

US MFN Drug Pricing Policy

- **Need** - US currently pays about three times more for the same drugs compared to other high-income nations.
- **Aim** - To bring drug prices in the US. *at par with the "Nation that pays the lowest price anywhere in the World."*
- **Issues** - Pharmaceutical companies have staunchly opposed this move and are lobbying for safeguards.
- They have expressed fear that the proposed price cuts *would reduce their profits,* which in turn would reduce funds for research on new medicines.

According to a Reuters report, the US accounts for nearly a third of India's pharma exports, which rose 16% to about $9 billion last fiscal year (2024-25).

Reference

The Indian Express| US MFN Pharma Policy

Farmer's Preferences for Rice and Wheat

***Prelims**: Economic Geography of India | Agriculture*

Why in News?

In last few decades times, both rice and wheat acreages across India was rising than other crops.

- **Reason for preferences** - The most primary reason for expansion in rice and wheat area is the government's *near-guaranteed purchases* of the 2 crops at ***minimum support prices (MSP)***.
- This kind of government backstop does not exist for other crops, discouraging their

cultivation.
    - For instance, Punjab's cotton area has plunged from 3.4 lh in 2015-16 to one lh in 2024-25 and in Madhya Pradesh.
- They are being grown *largely under irrigated conditions*.
- They also receive priority with regard to ***public breeding and research support.***
    - Cotton has seen no new breeding breakthroughs after the genetically modified (GM) Bt cotton hybrids commercialised during 2002-06.
    - Recently, Indian Council of Agricultural Research (ICAR) unveiled a genetically-edited (GE) mutant line of a rice & wheat.
- Being non-lodging made them more responsive to fertiliser and water application.
- They both have ***relatively lesser yield risk*** than other crops.
    - For example, yields in most oilseeds, pulses and other field crops have been flat or registered modest increases

YIELDS OF GREEN REVOLUTION WHEAT VARIETIES

Variety Name	Release Year	Average Yield	Potential Yield
Kalyan Sona	1969	3.76	4.6
HD-2329	1985	4.84	6.08
PBW-343	1996	4.92	6.1
HD-2967	2011	5.04	6.6
HD-3086	2014	5.43	7.11
HD-3385	2023	5.97	7.34
HD-3386	2024	6.25	7.69

Source: Indian Council of Agricultural Research

- The 1st generation of Green Revolution wheat varieties such as Kalyan Sona and Sonalika, released in the late-1960s, yielded an *average 3.8 tonnes of grain per hectare* under normal growing conditions in farmers' fields.
- These wheat varieties were bred for not only higher yields, but also for *resistance against rust diseases* (caused by fungal pathogens) and climate-smart traits.

*The **HD-3385 variety of wheat** released in 2023, for example, yields an average of 6 tonnes per hectare and potential of over 7.3 tonnes. It is, moreover, resistant to all major rusts – yellow (stripe), black (stem) and brown (leaf).*

Quick Facts

	Genome Edited Rice	Genome Edited Wheat
Variety	Pusa DST Rice 1	Kamala
Parent	Cottondora Sannalu (MTU-1010)	Samba Mahsuri
Edited gene	DST (drought and salt tolerance) gene, reducing its expression	Gn1a' gene - to reduce its expression
Effect	It becomes viable even under conditions of water, salinity and alkalinity stress.	It promotes cytokinin accumulation, leading to higher grain numbers.

- **Cytokinins** - They are plant hormones that help increase the number of grains per panicle.

- **DST (drought and salt tolerance) gene** - It acts as a negative regulator, inhibiting the rice plant's tolerance to abiotic stresses such as heat and salinity.

Reference

The Indian Express| Preference for Rice and Wheat Cropping in India

One Liners 14-05-2025

Geography

Lucknow's Urbanization and the Gomti

Recent, Lucknow's rapid modernization raises concerns among environmentalists and citizens about the future of its vital Gomti River, facing significant challenges from urbanization.

• **Gomti River -** Also called Gumti or Gomati, is a crucial tributary of the Ganges, flowing entirely within Uttar Pradesh.

• **Unique Water Source -** The Gomti is fed by both rainfall and groundwater, unlike the snow-fed Himalayan rivers that are major Ganges tributaries in the region.

• **River's Course -** Originating from Gomat Taal (Fulhaar Jheel) in Pilibhit district, the Gomti flows south through several districts, including Lucknow, before joining the Ganges near Saidpur, covering approximately 900 km.

• **Tributaries -** The Gomti drains a basin of about 18,750 square km. Its major tributaries include the Sai, Chowka, Kathina, and Saryu rivers.

• **Cities Along the Gomti -** Several important cities are situated along the banks of the Gomti River, including Sultanpur, Lucknow, Jaunpur, and Lakhimpur Kheri.

Polity & Governance

India Embraces Chip-Based e-Passports

India has recently launched chip-based e-passports, a significant leap in travel document modernization.

• ***Aims to** - Bolster security, simplify immigration, and meet international standards.*

• **The e-passport initiative** - Falls under the Passport Seva Programme (PSP) Version 2.0, which commenced on April 1, 2024, with a pilot phase in select Indian cities.

• **Tamil Nadu Leads in** - E-Passport Issuance **&** emerged as a frontrunner in e-passport adoption. As of March 22, 2025, over 20,000 e-passports have been issued in the state, demonstrating substantial progress.

• **Defining the Biometric e-Passport -** Or biometric passport, represents an advanced iteration of the conventional Indian passport. It incorporates an embedded Radio Frequency Identification (RFID) chip and antenna within the back cover.

• **Secure Storage -** The integrated chip securely stores the passport holder's personal information alongside biometric data, encompassing fingerprints and a digital photograph.

• **Identifying -** Indian e-passports are easily recognizable by a distinct gold-coloured chip symbol prominently displayed on the front cover.

International Relations and Issues

Taliban Suspends Chess in Afghanistan

Citing Islamic law concerns, the Taliban regime recently in Afghanistan banned chess on May 12, 2025, impacting recreation and drawing international criticism amid broader restrictions on sports and freedoms.

• **Taliban Chess Ban: Context -** Since regaining power in August 2021, the Taliban banned chess, citing religious concerns about gambling, following similar restrictions on women's sports, MMA, and cultural activities.

• **Sharia law** - Is Islam's comprehensive legal and moral framework, rooted in the Quran and Sunnah (Prophet Muhammad's practices).

• **Scope of Governance -** It guides Muslims' lives, encompassing religious practices, personal ethics, family law, and societal interactions.

• **Aim and Interpretation -** Sharia aims to lead individuals on a God-pleasing path, though its interpretation varies across schools of thought and cultures.

Kozhikode Joins WHO Age-Friendly Network

Kozhikode has been officially inducted into the WHO's Global Network of Age-friendly Cities and Communities, recognizing its dedication to creating an inclusive and supportive environment for its ageing population.

• **International Recognition** - On May 2, 2025, WHO acknowledged Kozhikode's efforts in promoting elderly-friendly policies and infrastructure, marking a significant global endorsement of the city's proactive approach.

• **Key Objectives and Focus** - Kozhikode aims to improve the quality of life for older adults through inclusive urban planning, focusing on accessible spaces, affordable housing, healthcare access, community support, and digital inclusion.

• **WHO Global Network (GNAFCC)** - Established in 2010, the GNAFCC connects cities committed to age-inclusive planning, encouraging policy innovation, elder participation, and cross-sectoral collaboration across over 50 countries.

• **Kozhikode's Initiatives** - The city has developed senior-friendly infrastructure, tailored community health services, conducted active ageing workshops, and utilized digital platforms for information and support.

• **About Kozhikode** - Located in Kerala and historically known as Calicut, Kozhikode has a strong legacy of social development and health indicators, governed by its Municipal Corporation.

UN Global Road Safety Week 2025

5. from May 12-18, 2025, the 8th UN Global Road Safety Week emphasizes the themes #MakeWalkingSafe and #MakeCyclingSafe.

• **United Nations and WHO -** Spearheaded by the United Nations in collaboration with the World Health Organization, this global campaign aims to enhance pedestrian and cyclist safety.

• **Core Focus Areas -** The week highlights the importance of dedicated walking and cycling lanes, urban speed limits of 30 km/h in busy areas, improved street lighting, and safe pedestrian crossings.

• **Primary Objectives -** The campaign's objectives include promoting safe and accessible infrastructure for non-motorized transport users and increasing awareness of the dangers they face on roads.

• **Driving Policy Reforms -** A key goal is to drive policy changes and stricter enforcement of traffic laws to significantly reduce fatalities and injuries among pedestrians and cyclists.

• **Call to Action -** The week urges governments, urban planners, and communities worldwide to prioritize and implement proven infrastructure and policy measures to ensure the safety of those walking and cycling.

India at UN Forum on Forests

• India actively participated in the 20th session of the United Nations Forum on Forests (UNFF) in New York.

• **Commitment to Global Forest Plan** - During the session, India reaffirmed its strong commitment to the United Nations Strategic Plan for Forests 2017–2030, a framework for sustainable forest management.

• **Establishment of UNFF** - The UN Forum on Forests was established in October 2000 through a resolution by the UN Economic and Social Council (ECOSOC).

• **Core Objective** - The primary objective of the UNFF is to promote the sustainable management, conservation, and development of all types of forests worldwide.

• **Broad Membership** - Membership in the UNFF is inclusive, encompassing all member states of the United Nations and its specialized agencies.

• **Reinforcing Political Will** - A key aim of the forum is to strengthen long-term political commitment at all levels for the sustainable use and preservation of global forest resources.

Environment

Banana Infructescence

A remarkable infructescence, measuring around 4.2 metres, has been documented in the wild banana species *Musa indandamanensis recently*. This establishes it as the longest recorded fruit cluster in bananas.

• **Infructescence -** Refers to a composite fruit structure, where multiple individual fruits are arranged along a central stalk, often with branching patterns.

• **Musa indandamanensis –** Is a unique banana species was first identified in 2012 within a secluded tropical forest near the Krishna Nala reserve forest in the Andaman and Nicobar Islands.

• **Distinctive Characteristics -** *Musa indandamanensis* exhibits unusual green flowers and a fruit bunch axis approximately three times larger than common banana varieties. The plant itself towers at about 11 metres, significantly taller than the usual 3-4 metre height of cultivated bananas.

• **Potential Benefits -** This wild species represents a valuable natural genetic resource. Plant breeders can utilize its unique traits to develop banana varieties with enhanced yields and improved disease resistance.

• **Significance of the Finding -** The discovery of this exceptionally long infructescence highlights the remarkable biodiversity within wild banana species and underscores the potential for genetic improvement in cultivated varieties.

Security

• **Army Enhances Anti-Drone Capabilities**
Indian Army's Air Defence units have deployed advanced weaponry, including L-70 guns, Zu-23mm systems, and Schilka systems, to effectively counter drone attacks originating from Pakistan.
• **Schilka System: A Key Component -** The Schilka system is a self-propelled, radar-guided anti-aircraft weapon system mounted on a robust tracked chassis for high mobility.
• **Russian Origin and Purpose -** This mobile air defense fire control system, of Russian origin, is specifically designed to protect exposed ground forces and armed vehicles from aerial threats.
• **Advanced Tracking Technology -** Equipped with a 3rd generation electro-optical system, a phased array 3D tracking radar, and a precise navigation system, Schilka provides comprehensive 360-degree coverage against air attacks, day or night.
• **Integrated Weaponry -** The system features a solid-state, hydraulically controlled turret that integrates both anti-aircraft guns and short-range air defense missiles for layered defense.
• **Enhanced Air Defence Posture -** The deployment of these sophisticated systems, particularly the Schilka, significantly bolsters the Army's air defence capabilities along the border, providing a robust response to evolving aerial threats.

Science

. **Sarvam AI's Bulbul v2 TTS Model**
Indian startup Sarvam AI has introduced its advanced Bulbul v2 Text-to-Speech (TTS) model.
• **Multi-Lingual Support -** Bulbul v2 boasts support for an impressive 11 Indian languages, catering to a diverse linguistic landscape.
• **Natural and Authentic Voices -** The model is engineered to generate voices that sound remarkably natural and authentic, avoiding robotic or artificial tones.
• **Fine-Tuning Capabilities -** Users gain the ability to personalize the generated speech by adjusting key voice characteristics such as pitch, pace, and loudness.
• **Enhanced User Experience -** These fine-tuning features contribute to a more engaging and tailored user experience with the text-to-speech output.
• **Potential Applications -** Bulbul v2 holds significant potential for various applications, including virtual assistants, content creation, accessibility tools, and enhanced human-computer interaction across India's diverse languages.