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1 DECEMBER 2025

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Daily News Analysis

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MONDAY, 1st DECEMBER 2025

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1. Pusa DST-1 and DRR Dhan 100 Kamala

- **Prelims** - Pusa DST-1 and DRR Dhan 100 Kamala
- **Mains** - GS 3 - Science and Technology

Why in the news?

- ICAR developed Pusa DST-1 and DRR Dhan 100 Kamala, two gene edited rice varieties.

Pusa DST-1

- **What is it?:** Drought tolerant rice variety developed by the Indian Council of Agricultural Research (ICAR) through Gene-editing tools.
- **Key Features:**
 - **DST gene-based drought tolerance:** Contains Drought Screening Tolerant (DST) allele introgressed through marker-assisted selection, which helps maintain yield under water-stress, especially during reproductive stages.
 - Semi-dwarf, early-maturing variety
 - Suitable for rainfed and drought-prone ecosystems of eastern & central India.
 - Enhanced root architecture enabling better water uptake.
 - High harvest index under moisture stress.

DRR Dhan 100 Kamala

- **What is it?:** Low glycemic index rice variety developed by ICAR–Indian Institute of Rice Research (IIRR), Hyderabad.
- **Key Features:**
 - **Low Glycemic Index:** Suitable for diabetics and health-conscious consumers.
 - High Yielding & Short-Duration Variety
 - **Superior Grain Quality:** Medium-slender grains, Good cooking quality and Soft texture, preferred by consumers.
 - Supports India's fight against lifestyle diseases.
 - Aligns with ICAR's Nutri-cereal and Healthy Grain Mission.



2. Digital Banking Channels

- Prelims - Digital Banking Channels
- Mains - GS 3 - Economy

Why in the news?

- RBI issued the final guidelines for the digital banking channels regarding obtaining informed consent from the customer for providing digital banking services.

Digital Banking Channels

- What is it?:

- Digital Banking Channels are **technology-enabled platforms** through which banks deliver financial services without requiring customers to visit physical branches.
- They are central to Digital India, financial inclusion, Payments Vision 2025, and RBI's push for digital public infrastructure (DPI).

- Major Digital Banking Channels in India

- **Internet Banking:** Web-based access using bank portals.
 - ★ Services: fund transfer, account management, bill payments, investments, e-statements.
 - ★ Supports NEFT, RTGS, IMPS, and UPI-linked payments.
- **Mobile Banking:** Delivered through banking apps like SBI YONO
 - ★ Services: balance check, loans, investments, FASTag, insurance.
 - ★ Includes: UPI apps (BHIM, PhonePe, Google Pay), USSD (99#) for feature phones and Aadhaar-enabled services (AEPS)
 - ★ Significance: Largest contributor to India's digital transaction growth.
- **ATMs (Automated Teller Machines):** Provide cash withdrawal, mini-statements, deposits, transfers.
 - ★ Types: On-site, off-site, white-label ATMs, cash recyclers.
 - ★ Role: Acts as a bridge between cash-based and cashless economy.
- **PoS (Point-of-Sale) Terminals:** Card-swiping or QR machines at shops and service centres.
 - ★ Includes: mPoS (mobile PoS) and QR-based PoS (UPI QR, BharatQR)



→ **Digital Wallets:**

- ★ Prepaid instruments regulated by RBI.
- ★ Examples: Paytm Wallet, Amazon Pay.
- ★ Used for e-commerce, bill payments, micro-transactions.

→ **AEPS (Aadhaar Enabled Payment System):** Allows bank transactions through Aadhaar authentication via micro-ATMs.

- ★ Used widely by: CSCs, BC (Bank Correspondents) and PM Jan Dhan Yojana ecosystem
- ★ Significance: Expands last-mile financial inclusion in rural India.

→ **Phone Banking / IVR Channels:** Customers perform basic services through interactive voice response.

→ **Digital-only / Neo-banks:** Banks that operate fully online (e.g., Jupiter, Fi, Niyo).

→ **Chatbots & AI-driven Banking:** Automates customer service, grievance resolution, personalised financial recommendations.

● **Benefits:**

- **Financial Inclusion:** Brings banking services to remote and underserved regions.
- **Convenience & Speed:** 24×7 access, instant payments (e.g., UPI, IMPS).
- **Cost Efficiency:** Reduces need for physical branches and manual processes.
- **Transparency:** Digital trails reduce corruption, leakage (e.g., DBT).
- **Boosts Digital Economy:** Drives formalisation of economic transactions.

● **Challenges:**

- **Cybersecurity Threats:** Phishing, data breaches, ransomware attacks.
- **Digital Divide:** Connectivity gaps, low digital literacy in rural areas.
- **Technical Glitches:** Network failures, server downtime.
- **Privacy Concerns:** Data misuse, lack of awareness of digital safety.



3. Tex-RAMPS Scheme

- Prelims - Tex-RAMPS Scheme
- Mains - GS 2 - Governance

Why in the news?

- The government approved the Tex-RAMPS Scheme to strengthen the Textile sector through promoting research, innovation and competitiveness.

Tex-RAMPS Scheme

- **What is it?:**
 - Textiles Focused Research, Assessment, Monitoring, Planning, and Start-up Scheme (Tex-RAMPS)
 - It is a Central Sector Scheme fully funded by the Ministry of Textiles.
- **Nodal Ministry:** Ministry of Textiles
- **Financial Outlay:** Rs. 305 crore for a period FY 2025-26 to FY 2030-31,
- **Objective:** To strengthen research, innovation, data systems, capacity-building and start-up ecosystem in India's textiles and apparel (T&A) sector, and thereby enhance global competitiveness.
- **Rationale:**
 - The textiles & apparel sector in India faces structural challenges: slow tech adoption, weak R&D/innovation ecosystem, fragmented supply-chains, absence of robust data & analytics for policymaking.
 - With global competition (from e.g., Vietnam, Bangladesh, China) increasing, the Indian T&A ecosystem needs to "future-proof" itself via smart/sustainable textiles, start-ups, and data-driven monitoring.
 - The scheme aligns with India's strategy of moving up the value-chain in textiles: from commodity manufacturing towards technical/smart textiles, circular economy, innovation-led manufacturing.
- **Features:**
 - **Research & Innovation:** Support advanced R&D in smart textiles, sustainability, emerging technologies within textiles (technical textiles, functional fabrics).



- **Data, Assessment, Monitoring & Planning:** Build strong data systems: employment mapping, supply-chain mapping, Integrated Textiles Statistical System (ITSS) for real-time analytics.
- **Capacity Building & State-level Support:** Workshops, best-practice sharing, strengthening State planning in textiles.
- **Start-up/Incubation Support:** Promote textile start-ups, hackathons, academia-industry linkages, incubation in textile domain.
- Fully Central Funded and co-terminus with Finance Commission cycle
- **Significance:**
 - Helps India's textile sector transition from large-scale commodity manufacturing to innovation-led, technology-driven value-chains.
 - Strengthens the innovation ecosystem within textiles- linkage between research institutions, industry and start-ups.
 - Improves evidence-based policy-making via robust data systems (employment, supply-chain, tech adoption)- important for targeted interventions.
 - Enhances global competitiveness of Indian textiles / apparel- aligning with export thrust, 'Make in India', etc.
 - Encourages new employment opportunities, start-up creation, upskilling of workforce in textiles.
 - Aligns with broader themes: sustainability, circular economy, smart manufacturing.



4. Fujiwhara Effect

- Prelims - Fujiwhara Effect
- Mains - GS 1 - Geography

Why in the news?

- The IMD has forecast the formation of two cyclonic storms in the Bay of Bengal, which may undergo a Fujiwhara interaction.

Fujiwhara Effect

- **What is it?:** The **Fujiwhara Effect** describes the interaction between **two nearby cyclonic systems** (tropical cyclones, depressions, or vortices) in which they **begin to rotate around a common centre**.
- **Occurrence:** It happens when,
 - Two cyclonic systems come within **~1,000 km** of each other (threshold varies with storm size/strength).
 - Both systems are strong enough to influence each other's circulation.
- **Types of Fujiwhara Effect:**
 - **Mutual Orbiting:**
 - ★ The cyclones revolve around a **common pivot point**.
 - ★ Typically, both rotate **counter-clockwise** in the Northern Hemisphere and **clockwise** in the Southern Hemisphere.
 - **Absorption / Merger:** A **stronger cyclone may absorb** the weaker one.
 - **Deflection:** Interaction may redirect one or both cyclones away from their expected tracks.
- **Effects:**
 - Unpredictable movement forecasting becomes challenging.
 - Possible rapid intensification or weakening, depending on energy transfer.
 - Can lead to changes in rainfall distribution and landfall location.
 - In rare cases, it can produce super cyclonic behaviour if environments are favourable.
- **Relevance to India:**
 - Bay of Bengal, being cyclone-prone, occasionally sees twin systems.
 - IMD sometimes issues alerts when:
 - ★ Two depressions/cyclonic storms coexist,
 - ★ Interaction could alter track, speed, intensity.



5. International Treaty on Plant Genetic Resources for Food and Agriculture

- **Prelims** - International Treaty on Plant Genetic Resources for Food and Agriculture
- **Mains** - GS 3 - Environment

Why in the news?

- The eleventh governing body meeting of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) or Plant Treaty concluded in Lima, Peru.

International Treaty on Plant Genetic Resources for Food and Agriculture

- **Origin**: Adopted in 2001 and came into force in 2004 under the FAO.
- **Aim**: Aims to ensure conservation, sustainable use, and fair & equitable benefit-sharing of Plant Genetic Resources for Food and Agriculture (PGRFA).
- **Associated Treaty**: Harmonized with the Convention on Biological Diversity (CBD).
- **Objectives**
 - Conservation of PGRFA through ex situ (gene banks) and in situ/on-farm methods.
 - Sustainable use of plant genetic diversity for crop improvement and resilience.
 - Fair and equitable benefit-sharing from use of genetic resources.
 - Recognition of Farmers' Rights and support for diverse farming systems.
- **Multilateral System (MLS)**
 - Facilitates access to 64 crops and forages in Annex I (e.g., rice, wheat, maize), providing ~80% of global plant-derived food.
 - Uses Standard Material Transfer Agreement (SMTA) for research, breeding, and training; mandates benefit-sharing if commercialized.
 - Prohibits intellectual property rights limiting access to resources in received form.
- **Farmers' Rights**
 - Protection of traditional knowledge relevant to PGRFA.
 - Equitable participation in benefit-sharing from resource use.



→ Involvement in national decisions on conservation and sustainable use, subject to national laws.

- **Governance and Benefits**

→ Overseen by a Governing Body under FAO, promoting implementation, technology transfer, and capacity-building.

→ Benefit-Sharing Fund supports on-farm conservation, especially in developing countries, via monetary and non-monetary means like information exchange.



6. Adenine Base Editing and Thalassemia

- **Prelims** - Adenine Base Editing and Thalassemia
- **Mains** - GS 3 - Science and Technology

Why in the news?

- Scientists recently tested a gene-editing method called adenine base editing to fix two severe mutations that cause -thalassemia, a genetic blood disease.

Adenine Base Editing

- **What is it?**

- Adenine base editing (ABE) is a CRISPR-based genome editing technology that enables precise conversion of adenine (A) to guanine (G) in DNA, resulting in A- T to G- C base pair changes without inducing double-strand breaks.
- Developed through directed evolution of TadA deaminase fused to a catalytically impaired Cas9 (dCas9 or nCas9), it offers higher precision than traditional CRISPR-Cas9 for point mutations.

- **Mechanism**

- ABE operates via three key components: a deactivated Cas protein for targeting, a guide RNA (gRNA) for locus specificity, and an adenine deaminase for base modification.
- Cas9 (nickase or dead) binds DNA via gRNA, forming an R-loop that exposes single-stranded non-target strand (NTS).
- TadA deaminase converts A to inosine (I) on NTS; inosine pairs with cytosine during repair.
- Nick on target strand (TS) directs repair, incorporating G- C pair post-replication.

- **Features**

- Editing window typically spans positions 3-12 relative to PAM (e.g., NGG), with variants like ABE8e/9e optimizing efficiency and reducing bystanders.
- Low indel rates (<1%) compared to DSB-based editing; evolved versions (ABE7.10 to ABE8s) boost activity 1.5-3x at key sites.
- Applicable in human cells, plants (e.g., rice), and for research/therapeutics



- **Applications**

- **Human Health**

- ★ Correcting monogenic disorders caused by A→G mutations: Sickle Cell Disease, β-thalassemia, Familial hypercholesterolemia, Duchenne muscular dystrophy, etc.
 - ★ Potential for in vivo gene therapy using viral vectors (e.g., AAV).

- **Agriculture**

- ★ Creating high-yield, stress-tolerant, or disease-resistant crops without inserting foreign genes.
 - ★ Useful for precision breeding and non-transgenic crop improvement.

- **Biotechnology & Research**

- ★ Functional genomics, studying protein function, metabolic pathway alterations.

- **Benefits**

- High precision editing at single-base level.
 - No double-strand breaks → safer than CRISPR-Cas9.
 - Extremely low off-target activity.
 - More efficient and predictable than earlier gene-editing tools.

- **Limitation**

- Works mainly for A→G conversions (other base edits need separate editors).
 - Targeting restrictions due to PAM dependency of CRISPR.
 - Delivery challenges for in vivo therapeutic use.
 - Ethical & regulatory concerns similar to CRISPR.

Thalassaemia

- **What is it?**: It is the name for a group of inherited conditions that affect a substance in the blood called haemoglobin.
- **Cause**: Caused by mutations in HBA1/HBA2 (alpha genes) and HBB (beta gene).
- **Symptoms**
 - Chronic anemia
 - Fatigue, weakness
 - Pale skin (pallor)



- Slow growth in children
- Enlarged spleen (splenomegaly)
- Bone deformities (especially facial bones)
- Jaundice (due to hemolysis)

- **Diagnosis**

- CBC: Low hemoglobin, microcytic hypochromic anemia.
- Peripheral smear: Target cells, anisopoikilocytosis.
- Hemoglobin electrophoresis / HPLC: ↑ HbA₂, ↑ HbF in β-thalassaemia.
- Genetic testing for mutation confirmation.
- Prenatal diagnosis: Chorionic villus sampling / amniocentesis.

- **Treatment**

- Blood transfusions– regular blood transfusions treat and prevent anaemia; in severe cases these are needed around once a month.
- Chelation therapy – treatment with medicine to remove the excess iron from the body that builds up as a result of having regular blood transfusions
- The only possible cure for thalassaemia is a stem cell or bone marrow transplant