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## By PRAYAAS EDUCATION

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# MAINS FOCUS

# 3.General Studies 3

## 3.1 Makhananomics: India's Emerging Superfood Economy

### Context:

- At a rally in Samastipur, Bihar, PM Modi described the newly inaugurated **National Makhana Board as a "revolutionary step" for farmers.**

### What is Makhananomics?

- Makhananomics refers to the entire economic ecosystem around Makhana (foxnut), covering cultivation, harvesting, processing, value addition, branding, and marketing. It highlights how a traditional aquatic crop is transforming into a high-value agri-business sector.

**Syllabus of Mains – GS-3- Agriculture & Economy (Agro-based Industries and Rural Development)**

### Major Producing Regions

- **Bihar: 90% of India's makhana output.**
- **Key districts**: Darbhanga, Madhubani, Purnea, Katihar, Saharsa, Supaul, Araria, Kishanganj, Sitamarhi.
- **Four districts contribute 80% of Bihar's production**: Darbhanga, Madhubani, Purnea, Katihar
- **GI Tag: "Mithila Makhana" received GI tag in 2022.**
- **Other producing states:** Assam, Manipur, West Bengal, Tripura, Odisha, small pockets in J&K and Uttar Pradesh.
- Cultivation also occurs in Nepal, Bangladesh, China, Japan, Korea.


### What is Makhana?

- **Makhana (fox nut)** is the dried edible seed of the **Euryale ferox plant**, a prickly water lily found in freshwater bodies across **South and East Asia.**
- It is known for violet-white flowers and large prickly leaves (up to 1 m diameter).
- Because the raw seed has a dark exterior, it is often called **"Black Diamond."**
- **India is the world's largest producer and consumer of makhana.**

**Nutritional Value & Uses**

- Low fat, high carbohydrates, moderate protein; contains potassium, magnesium, fibre, iron, and antioxidants.
- Considered a **low-glycaemic food** suitable for diabetic and heart-health diets.

**Used in:**

1) **Ayurveda & traditional medicine** (anti-inflammatory, anti-ageing properties).
2) **Health & wellness foods** (energy mixes, protein snacks).
3) **Culinary uses:** popped makhana (lava), kheer, curries, trail mixes, and roasted snacks.
4) **High shelf-life:** suitable for export and packaged food industry.

## Challenges Facing the Makhana Sector

- **Poor Processing Infrastructure**: Bihar lacks modern processing and export facilities, forcing farmers to sell raw makhana cheaply to states like Punjab and Assam, which earn higher profits after value addition.
- **Low Farmer Income:** Middlemen dominate the supply chain, and the demand for an MSP remains unmet, keeping farmer earnings low.
- **Labour-Intensive Cultivation:** Harvesting requires manual pond diving, making the process costly, slow, and physically demanding.
- **Low Productivity**: Traditional methods yield only 1.7–1.9 t/ha, while improved ICAR varieties like Swarna Vaidehi and Sabour Makhana-1 can achieve 3–3.5 t/ha, indicating a big technological gap.
- **Limited Mechanisation:** Efforts to mechanise makhana harvesting have failed because no efficient machinery exists for pond-based cultivation.
- **Future Needs:** Technological innovation, R&D, and machinery suited to aquatic farming are essential to boost productivity and reduce labour dependence.
- **Low Value Capture in Bihar**: Despite producing ~90% of India's makhana, Bihar contributes little to exports.
- **Other States Gain More:** Punjab and Assam buy raw makhana from Bihar, process or repackage it, and capture most of the profits through value addition.

## National Makhana Board

1) **Launch of Board**: PM Narendra Modi launched the National Makhana Board in Purnea, Bihar on 15 September.
2) **Budget Allocation**: The Board has an **initial funding of ₹100 crore** to strengthen the makhana sector.
3) **Production Boost:** Aims to increase production **by promoting HYVs like Swarna Vaidehi and Sabour Makhana-1.**
4) **Processing & Value Addition:** Focuses on improving processing units, reducing wastage, and enhancing product quality.
5) **Farmer Training:** Provides training and capacity-building programmes to modernise cultivation practices.
6) **Scheme Integration:** Connects farmers with Central and State government schemes for financial and technical support.
7) **Food Processing Institute:** A proposed institute will serve as a centre for innovation, R&D, skill development, and entrepreneurship.
8) **Export Promotion:** Strengthens export potential through **cargo-enabled airports in Patna, Purnea, and Darbhanga.**
9) **Quality Regulation:** Sets and enforces quality standards for production, processing, and packaging.
10) **Branding & Market Expansion:** Promotes makhana under **ODOP (One District One Product)** and supports national–international branding to expand market reach.

## Impact of Government Initiatives on Makhana Production and Rural Livelihoods

- **Higher Farmer Income & Jobs:** Government support has improved makhana productivity and profitability, creating rural employment in both cultivation and processing.
- **Women's Empowerment:** Increased participation of women in processing and skill-development programmes has boosted their income and social autonomy.
- **Strengthening of FPOs:** Promotion of FPOs and cooperatives has enhanced farmers' collective bargaining power and ensured better market access.
- **Sustainable Agriculture:** Makhana's low water requirement and integration with fish farming support sustainable, diversified agricultural systems.
- **Growth of Agro-Processing:** Investment in processing units, cold chains, and storage has expanded makhana-based industries and created value-added jobs.

- **Boost to Exports:** The GI tag for Mithila Makhana and government-led branding initiatives have strengthened India's position in the global makhana market.

## Conclusion

- Government interventions are shaping **a new "Makhanomics" model** that aligns scientific innovation, farmer welfare, and market expansion. Continued investment, institutional clarity, and technological adoption can position **Bihar as a global hub for high-value makhana and make the crop a catalyst of rural economic transformation.**

### Mains Question for Practice-

1) **"Government initiatives around the emerging 'Makhanomics' ecosystem aim to transform Bihar's rural economy." Discuss.**

# 3.2 Fuelling India's Future with Deep Tech

## Context

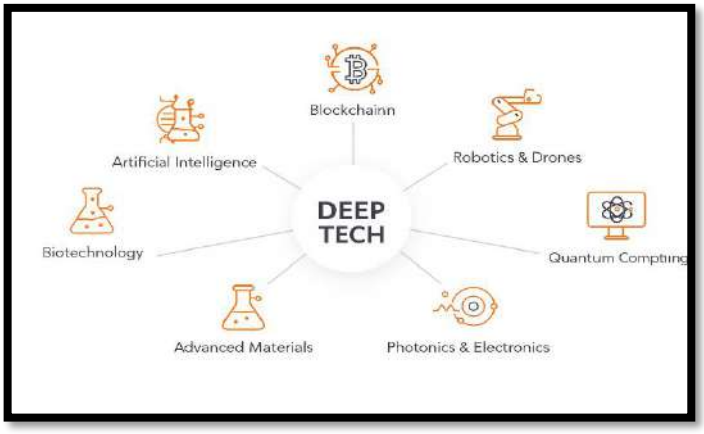
- Union Minister Piyush Goyal addressed the TiEcon session **titled 'India's Deeptech Moment: From Digital Leadership to Technological Sovereignty.'** He **highlighted how India is transitioning from being a global digital powerhouse to achieving self-reliance.**

**Syllabus of Mains – GS-3-**

**Science & Technology (Achievements of Indians in science & technology; indigenization of technology and developing new technology)**

## Key Highlights from Piyush Goyal's Address

- **Technological Self-Reliance:** India must reduce dependence on foreign technologies to ensure national security and long-term strategic stability.
- **Rise of the Deeptech Ecosystem:** India is expanding capabilities in AI, quantum computing, semiconductors, defence tech, and space technologies.
- **Strengthening Supply Chain Resilience:** Global disruptions showed the need for India to secure critical inputs and build self-sufficient supply chains.
- **Impact of Digital India**: **Internet users rose from 250 million to over 1 billion,** enabling efficient welfare delivery through Aadhaar, DBT, and Jan Dhan.
- **Major Boost to Research & Innovation Funding: The Startup Fund of Funds (2nd edition) and ₹1 lakh crore Anusandhan Fund** aim to strengthen early-stage deeptech innovation.
- **India's Talent Advantage:** With the world's largest pool of engineers and STEM graduates, India is well-positioned to become a global deeptech hub, supported by TiE (The Indus Entrepreneurs).




## India's Dependence on Foreign Technology

- **Critical Minerals:** India imports lithium, cobalt, nickel, and rare earth elements (REEs).
- **Telecom Equipment:** 4G/5G gear and optical networks rely on foreign original equipment manufacturers (OEMs).
- **Aerospace & Defence Materials:** High-grade alloys, avionics, and composites for aircraft and defence systems are imported.
- **Medical Technology:** Advanced equipment such as magnetic resonance imaging (MRI) machines, computed tomography (CT) scanners, and surgical robots come from global suppliers.
- **Cybersecurity & Cloud:** Dependence on foreign cloud service providers (CSPs), encryption tools, and enterprise software.
- **Precision Sensors:** Micro-electro-mechanical systems (MEMS) sensors, inertial navigation systems (INS), and infrared (IR) detectors are mostly imported.
- **Specialty Chemicals:** Semiconductor-grade chemicals, including photoresists and high-purity gases (HPGs), are sourced from abroad.

## Challenges Arising from Foreign Technology Dependence

- **Economic Vulnerability:** High import dependence increases the current account deficit and exposes India to global price shocks. **(E.g., large electronics import bills.)**

- **Innovation Deficit**: Domestic firms depend on foreign patents and technologies, limiting indigenous R&D capacity and weakening India's global technological competitiveness. **(E.g., low share in global AI patents.)**
- **Loss of Domestic Value Addition:** Critical manufacturing and high-end production shift abroad, reducing domestic value capture and limiting India's movement up the technology value chain**. (E.g., deeptech manufacturing employs a very small share of India's tech workforce.)**
- **Strategic & Security Risks:** Reliance on foreign technologies in defence, space, telecom, and digital systems **exposes India to supply disruptions, geopolitical leverage, and technology denial regimes.**
- **Threat to Digital Sovereignty:** Dependence on foreign cloud platforms and software ecosystems compromises data autonomy and cyber-resilience. **(E.g., majority of cloud infrastructure handled by foreign firms.)**
- **Slow Development of Domestic Ecosystem:** Continuous import reliance hampers growth of domestic manufacturing, weakens local supplier networks, and delays creation of competitive deeptech industries.

## Economic and Strategic Risks

- **Pressure on External Finances**: Heavy import reliance pushes up the current account deficit, with electronics alone exceeding USD 70 billion in imports (2024).
- **Weak Indigenous Innovation Capacity:** Dependence on foreign patents limits domestic R&D advancement; India accounts for less than 1% of global AI patent filings.
- **Limited High-Skill Job Creation:** Overseas value addition reduces domestic employment opportunities, with deeptech manufacturing engaging under 2% of India's tech workforce (NASSCOM, 2023).
- **Erosion of Digital Autonomy**: Foreign control over software and cloud systems weakens data sovereignty, as over 75% of India's cloud infrastructure is run by U.S.-based firms (IDC, 2024).

### What is Deep Tech?

- **Deep tech (deep technology**) refers to advanced technologies rooted in significant scientific or engineering innovation.
- **These innovations are considered "deep" because they offer highly sophisticated solutions to complex problems.**
- Common examples include genomics, robotics, nanotechnology, quantum technologies, and clean energy.
- The term originally described any complicated technology but gained a sharper definition in the last decade.
- **In 2014, Swati Chaturvedi (Propel(x)) coined the modern definition widely used today.**

## Future Action Plan

- **Emerging Tech Governance:**
  Create clear regulations for AI, quantum, and data security to ensure responsible innovation.
  **E.g.,** drafting a National AI Ethics & Safety Framework to guide deployment across sectors.
- **National Compute & Lab Infrastructure:**
  Build shared high-performance compute grids, quantum labs, and fabrication facilities.
  **E.g.,** establishing a National AI Compute Grid providing GPU access for startups and universities.
- **IP Commercialisation Reform:**
  Speed up patents and improve tech-transfer from labs to industry.
  **E.g.,** a Bayh-Dole–style policy allowing universities to commercialise publicly funded innovations.
- **Public–Private R&D Clusters:**
  Set up co-located research zones linking academia, industry, and startups.
  **E.g.,** expanding Bengaluru-style deeptech clusters focused on AI chips and robotics.
- **Strategic Government Procurement:**
  Use government demand to accelerate adoption of indigenous deeptech solutions.
  **E.g.,** defence & healthcare systems prioritising Indian AI-based surveillance and diagnostics tools.

- **Deeptech Testbeds & Regulatory Sandboxes:**
  Provide real-world testing environments for early-stage technologies.
  **E.g.,** drone and robotics sandboxes enabling controlled field trials for startups.
- **Sovereign Technology Stack:**
  Develop indigenous AI models, cloud platforms, cybersecurity, and operating systems.
  **E.g.,** a BharatGPT-class multilingual LLM stack for public services and enterprises.
- **Global Tech Diplomacy & Co-development:**
  Form alliances for joint research, supply-chain resilience, and standards setting.
- **E.g.,** leveraging the Quad Critical & Emerging Tech (CET) framework for semiconductor co-development.

## Conclusion

- As India steps into an era defined by deep technologies, the imperative is to transform scientific capability into strategic strength**. As Albert Einstein observed, "We cannot solve our problems with the same thinking we used when we created them."** Deep tech embodies this new thinking.
- With focused investment, talent development, and sustained policy support, India can harness deep tech to drive innovation, enhance self-reliance, and shape its future as a global technological leader.

### Mains Question for Practice-

2) **"Deep tech represents the next wave of strategic innovation." Examine the opportunities and challenges for India in developing a robust deep-tech ecosystem.**

# 3.3. Transforming Indian Agriculture by 2047

## Context:

- NITI Aayog's Frontier Tech Hub released a roadmap in Gandhinagar called **"Reimagining Agriculture**: **A Roadmap for Frontier Technology-Led Transformation"** which lays out a tech-driven, inclusive, and resilient vision for agriculture by 2047.

> **Syllabus of Mains – GS-3-**
>
> **Agriculture & Economy (E-technology in the aid of farmers)**

## NITI Aayog's "Reimagining Agriculture" Roadmap

### Objective:

- Aims to transform Indian agriculture using frontier technologies such as AI, precision farming, remote sensing, drones, and smart mechanisation.
- Focuses on sustainability, productivity enhancement, and improved farmer incomes.

### Digital Agriculture Mission 2.0 – Three-Pillar Framework:

1. **Data Ecosystems:** Build robust digital infrastructure for last-mile connectivity and integrated farm-level data.
2. **Innovation Systems:** Strengthen R&D, skill development, and technology diffusion for modern agriculture.
3. **Policy–Industry Convergence:** Align private sector expertise with government reforms to scale technology adoption.

### Farmer-Centric Approach: Introduces a three-tier segmentation model:

1. **Aspiring Farmers (70–80%) –** Require basic digital access and capacity building.
2. **Transitioning Farmers (15–20%)** – Need support for adopting modern practices and digital tools.
3. **Advanced Farmers (1–2%)** – Ready for cutting-edge technologies and innovation-driven models.

Ensures tailored interventions based on farmers' readiness and resources.

**State-Level Leadership:** Highlights Gujarat as a leading example, leveraging tools like **the Digital Crop Survey and i-Khedut portal for digitisation**, transparency, and direct benefit delivery.
**Institutional Support: Led by NITI Aayog's Frontier Tech Hub,** integrating public sector innovation with private sector technological capabilities.

**Long-Term Vision: Aligns with Viksit Bharat 2047,** focusing on:

1. Strengthening farmer autonomy Promoting
2. data-driven decision-making
3. Enhancing market access and value-chain integration

### Vision Document Highlights

1. Presents a strategic blueprint to mainstream frontier tech — AI, IoT, digital twins, drones, agentic AI, and bio-innovation — in agriculture.
2. Reinforces the Digital Agriculture Mission 2.0 with the same three pillars of foundational data systems, innovation capacity, and policy–industry synergy.

## Challenges to Agricultural Transformation

- **Fragmented Data Ecosystems:** The absence of standardised, interoperable data frameworks prevents seamless integration of digital platforms, undermining real-time farm intelligence.
- **Low Digital Confidence: Limited digital literacy and a persistent trust gap** among smallholders slow the adoption of tech-driven advisories, fintech solutions, and smart tools.
- **Rural "Phygital" Divide**: Poor connectivity, unreliable infrastructure, and weak rural logistics continue to restrict the reach of **phygital agriculture services** such as drones, IoT sensors, and online marketplaces.
- **Talent & Skill Shortages:** A critical deficit in **AI–agriculture skill fusion** hampers workforce readiness for precision farming, data-driven decisions, and next-gen automation.
- **Constrained Innovation Financing**: Limited access to **risk-tolerant capital**, slow-moving public funding, and inadequate support for deep-tech startups restrict scalable agricultural innovation.

## Current Status of Indian Agriculture

**1. Economic Importance**

**Agriculture contributes around 18% to India's GDP (Economic Survey 2024).**

It remains the primary source of livelihood, employing 43–46% of the workforce (PLFS 2023).

**2. Landholding Pattern**

86% of Indian farmers are small and marginal, owning less than 2 hectares, with the average size increasingly below 1 ha (Agriculture Census 2021).

**3. Productivity Challenges**

**India's crop yields are 30–40% lower than global averages due to:**

a) Small, scattered plots
b) Low mechanisation
c) Inefficient input use
d) Limited access to extension and digital tools
e) Post-harvest losses exceed USD 18 billion annually, weakening farm incomes.

**4. Climate and Resource Stress**

a) **50% of net sown area is rainfed, making agriculture climate-sensitive (ICAR 2024).**
b) Erratic rainfall, soil degradation, and declining groundwater levels heighten production risks.
c) Water scarcity threatens long-term sustainability and resilience.

**5. Digital, Credit & Infrastructure Gaps**

a) Many farmers still face barriers in accessing formal credit, crop insurance, market linkages, and digital platforms.
b) Weak supply chains and storage infrastructure reduce value realisation.

**6. Growth of Agri-Tech Ecosystem: India now hosts over 3,000 Agri-tech startups (**NASSCOM 2025).

## Agriculture Initiatives

- **Agriculture Accelerator Fund:** Launched to support agri-startups, deep-tech solutions, precision farming, and climate-tech innovations.
- **Kisan Drone Scheme:** Promotes the use of drones for spraying, mapping, and crop monitoring to improve precision agriculture.
- **Digital Agriculture Mission(2021-2025):** Creates an integrated digital ecosystem connecting farmer databases, land records, and advisory systems.
- **AgriStack (Initiated 2021):** A digital public infrastructure framework enabling personalised advisories, credit access, and insurance services.
- **FPO Promotion Scheme – 10,000 FPOs:** Aims to form Farmer Producer Organisations for collective marketing, procurement, and value chain integration.
- **National Mission on Edible Oils – Oil Palm (NMEO–OP):** Strengthens domestic oilseed and oil palm production to reduce import dependence.
- **PM-KUSUM:** Promotes solar-powered irrigation and decentralised renewable energy in agriculture.
- **PM-KISAN:** Provides ₹6,000 annual direct income support to eligible farmer households.

- **Pradhan Mantri Fasal Bima Yojana (PMFBY):** Offers technology-backed crop insurance with remote sensing and satellite monitoring.
- **Soil Health Card Scheme (2015):** Provides plot-specific nutrient profiles to encourage balanced fertiliser use and improve soil health.

## Conclusion

- NITI Aayog's roadmap envisions **a tech-enabled, inclusive and climate-resilient agriculture system,** strengthening productivity and competitiveness to build a future-ready farm sector by 2047, consistent with the vision of Viksit Bharat.

**Mains Question for Practice-**

1. **How can frontier technologies contribute to making Indian agriculture more productive, sustainable, and farmer-centric?**

# 3.4 Urea Crisis

## Context:

- **India's urea use has climbed steadily from around 18 million tonnes in the 1990s to a record 38.8 million tonnes in 2024–25.** Consumption of the highly subsidised price-controlled fertiliser is growing much faster than domestic production, calling for deft demand-supply management.

**Syllabus of Mains – GS-3-**

**Agriculture & Economy (Issues related to direct and indirect farm subsidies and minimum support prices)**

## Trend of Urea Consumption in India

- **Doubling Over Two Decades:** Urea use grew from ~14 MT in 1990–91 to 28.1 MT by 2010–11, driven by cropping expansion and low prices.
- **Fluctuation but Upward Trend:** Consumption touched 30.6 MT in 2013–14, dipped slightly to 29.9 MT in 2017–18, but remained consistently high.
- **Neem-Coated Urea (2015):** Introduced to improve efficiency and reduce diversion, yet consumption kept rising, crossing 35 MT in 2020–21.
- **Projected Peak**: Urea demand is expected to reach 40 MT in 2025–26, the highest in India's history.
- **Price-Driven Demand:** Unchanged low MRP continues to incentivise excessive usage.
- **Emerging Concerns:** Rising demand and stagnant domestic output are creating risks of supply pressure and subsidy burden.

## What It Means

- **Consumption–Production Imbalance:** Urea consumption is consistently overtaking domestic output, creating a structural deficit that threatens agricultural and fiscal sustainability.
- **Agriculture-Driven Demand Surge**: Urea use has risen from 38.8 MT to nearly 40 MT in 2024–25 due to intensive cultivation, nitrogen-heavy crops, good monsoons, and a decade-old unchanged low MRP.
- **Stagnant Production Despite New Plants**: Even with six new plants adding 7.6 MT capacity, production peaked at only 31.41 MT because of energy constraints, operational inefficiencies, and ageing units.
- **Growing Import Dependence & Strategic Risk:** India imported 7.04 MT in 2023–24, increasing vulnerability to global price shocks, logistical disruptions, and geopolitical uncertainties despite efforts for long-term supply contracts.

## Key Drivers of Rising Urea Demand

- **Record Consumption Growth**: Urea sales hit 38.8 MT in 2024–25, the highest ever, and are projected to reach ~40 MT this fiscal year.
- **Persistent Price Distortion**: Urea's MRP has remained virtually unchanged since 2012 at ₹5,360/tonne (₹5,628 with neem-coating), while DAP and MOP often retail at ₹27,000–₹34,000/tonne, making urea 4–7 times cheaper and encouraging excessive nitrogen use.
- **High Subsidy Support**: The government's fertiliser subsidy routinely exceeds ₹1.5 lakh crore per year, with urea alone absorbing the largest share—keeping prices artificially low and consumption high.
- **Government Measures Not Curbing Use:**
  a) **Neem-coated urea (2015**) aimed to improve nitrogen-use efficiency and prevent diversion.
  b) **Reduction of bag size from 50 kg to 45 kg (2018)** was intended to indirectly limit consumption.
  c) **Nano Urea (2021)** was promoted as a substitute for conventional urea.
  **d) Despite these steps, demand rose steadily—from 30.6 MT in 2013–14 to todays near 40 MT.**
- **Cropping & Irrigation Expansion:** Greater area under rice, wheat, sugarcane, and expanding irrigation continue to push nitrogen requirements upward, further raising urea dependence.

- **Key Implications:** The widening gap worsens fiscal burden and soil nutrient imbalance, requiring subsidy rationalisation, balanced fertilisation, and boosted domestic green ammonia/urea capacity.

## Status of Fertilizers in India

- **High Dependence on Urea:** India is one of the world's largest consumers of urea, with demand consistently exceeding domestic production, leading to reliance on imports.
- **Major Importer of Nitrogen & Phosphatic Fertilisers**: India is the largest global buyer of Urea and DAP, importing significant quantities to meet its nutrient needs due to inadequate domestic capacity.
- **Subsidy-Driven Market:** Fertiliser prices—especially urea—are heavily subsidised, and the fertiliser subsidy bill regularly crosses ₹1–1.5 lakh crore, making urea the cheapest and most overused fertiliser.
- **Nutrient Imbalance:** Excessive focus on urea has created a severe N:P:K imbalance, harming soil health and reducing long-term productivity.
- **Production Gap:** Despite expansion projects and new plants under the revival of closed urea units, domestic production remains insufficient to match rising agricultural demand.
- **Growing Push for Alternatives:** Initiatives like Liquid Nano Urea, neem-coated urea, and promotion of balanced fertilisation aim to reduce dependence on conventional urea.
- **Policy Shifts Underway**: The government is moving towards self-sufficiency in urea, improving indigenous manufacturing, and curbing import vulnerability amid global price fluctuations.

### Urea Fertilizer – Prelims Pointers

- **Composition:** Urea contains 46% nitrogen (N) — the highest among solid nitrogen fertilizers.
- **Subsidy:** Urea is the only fully government-controlled fertilizer with a fixed MRP across India.
- **Color & Form:** It is a white crystalline, highly water-soluble synthetic fertilizer.
- **Neem-Coated Urea:** Mandatory since 2015 to improve nitrogen-use efficiency and prevent diversion for industrial use.
- **MRP:** Urea's MRP has remained almost unchanged since 2012, making it the cheapest nitrogen source.
- **Nutrient Imbalance:** Overuse of urea contributes heavily to India's **N:P:K imbalance** and soil degradation.
- **Production:** Domestic urea production remains below consumption, leading to reliance on imports.
- **Nano Urea:** Introduced by IFFCO, 500 ml bottle equals one conventional urea bag in nitrogen efficacy.
- **Bag Size:** Urea bags were reduced from 50 kg to 45 kg in 2018 to discourage overuse.
- **Relevance:** Urea is essential for crops like rice, wheat, and sugarcane, which are nitrogen-demanding
- **Subsidy Burden**: Urea accounts for the largest share of India's fertiliser subsidy bill.
- **Usage Pattern**: India is among the world's largest consumers and importers of urea.

## Important Policy Interventions by the Government

- **Nano Urea Production**: Eight new centrally monitored Nano Urea plants across states like Karnataka, Uttar Pradesh, and Assam are set to begin production by November 2025 to boost indigenous supply.
- **Neem-Coated Urea (NCU) Mandatory**: The DoF mandates 100% neem-coating of all urea to enhance nitrogen-use efficiency, prevent diversion, and improve soil and crop health.
- **New Urea Policy (NUP) 2015:** Focuses on maximising domestic urea production, improving energy efficiency of plants, and rationalising the government's subsidy burden.
- **New Investment Policy (NIP) 2012 (Amended 2014):** Aims to attract fresh investments and modernise the urea sector to help India achieve long-term self-sufficiency.
- **Policy on Promotion of City Compost (2016):** Provides ₹1,500 per tonne support to promote production and use of city compost for soil enrichment and waste utilisation.

- **Use of Space Technology in Fertilisers:** A three-year ISRO-led pilot maps rock phosphate reserves using satellite spectroscopy to strengthen raw material security.
- **Nutrient Based Subsidy (NBS) Scheme 2010**: Offers fixed yearly subsidies for P&K fertilisers based on nutrient content to promote balanced fertiliser application.

## Future Action Plan

- **Ensure Reliable Supply of Non-Urea Fertilisers:** Strengthen availability of DAP and MOP (Di-Ammonium Phosphate – DAP; Muriate of Potash – MOP) at affordable prices despite continued dependence on imported raw materials.
- **Universalise DBT in Fertilisers:** Expand the Direct Benefit Transfer system across the fertiliser sector to improve transparency and deliver subsidies efficiently.
- **Curb Leakages and Corruption:** Implement strict monitoring and accountability measures to eliminate diversion, fraud, and misuse in subsidy distribution.
- **Reduce Fiscal Burden:** Cleaning up subsidy delivery and ensuring efficient fertiliser use will significantly lower the government's rising subsidy bill.
- **Strengthen Policy Commitment:** Effective reform requires strong political and administrative resolve to streamline systems and promote balanced, sustainable fertiliser use.

## Conclusion

- India's growing gap between urea demand and production, rising subsidies, import risks and soil harm requires urgent reforms—boosting domestic capacity, promoting balanced nutrients and using digital systems to ensure food and fiscal security.

**Mains Question for Practice-**

2. **"Self-sufficiency in urea is not merely an economic goal but a strategic necessity." Analyse this statement in light of India's import dependence and global price volatility.**