# Agricultural Transformation for Bharat@2047

***This editorial is based on "Why agriculture is key to building Viksit Bharat" which was published in The Hindustan Times on 04/08/2025. The article brings into picture India's remarkable agricultural transformation—from pre-1960s food insecurity to record output in 2024–25- while highlighting the pressing need to address challenges in productivity, sustainability, and modernization to realize the vision of Viksit Bharat by 2047.***

**For Prelims: Agricultural Infrastructure Fund , Digital Agriculture Mission, AgriStack, Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) scheme, e-NAM (National Agriculture Market), Pradhan Mantri Krishi Sinchai Yojana , Minimum Support Price.**

**For Mains:** Key Developments Transforming Indian Agriculture, Key Issues Hindering the Effectiveness of the Indian Agriculture System.

India's agricultural transformation from **pre-1960s food insecurity** to record-breaking production of **353.96 million tonnes in 2024-25** exemplifies the nation's journey toward **Viksit Bharat.** This agricultural renaissance has evolved from basic subsistence to diversified **agri-industries spanning dairy, poultry, and fisheries.** However, despite these remarkable achievements, agriculture still faces critical challenges in **productivity, sustainability, and modernization**. As the foundation of economic stability, agriculture serves as the vital river that, once these hurdles are overcome, will**decisively flow toward India's vision of becoming a developed nation by 2047.**

## What are the Key Developments Transforming Indian Agriculture?

- **Agricultural Infrastructure Investment:** The Indian government's substantial investment in agricultural infrastructure is transforming the sector. Initiatives like the **Agricultural Infrastructure Fund (AIF) and Pradhan Mantri Kisan Sampada Yojana (PMKSY)** are modernizing storage, processing, and transportation systems.
    - These efforts are crucial in reducing post-harvest losses and improving supply chain efficiency.
    - The **Gross Capital Formation (GCF) of the agriculture sector** grew at the rate of **19.04% in 2022-23**
        - The AIF, with an **investment target of ₹1 lakh crore,** is improving storage, cold chains, and market linkages, essential for reducing food wastage.
- **Technology Integration and Digitalisation of Agriculture**: India is increasingly adopting modern technologies such as AI, blockchain, and drones to enhance agricultural productivity.
    - The **Digital Agriculture Mission, launched in 2024** with a financial outlay of ₹2,817 crore, aims to establish **Digital Public Infrastructure (DPI) for agriculture.**
        - **AgriStack is the foundational pillar of the DPI,** designed to be a digital public good similar to "Aadhaar" for farmers.
    - Digital initiatives like **e-NAM (National Agriculture Market)** are enhancing market access for farmers, ensuring better price discovery and reducing middlemen.
- **Push for Sustainable Agriculture and Organic Farming Growth:** Sustainability is gaining momentum with organic farming's rapid growth, spurred by policy incentives and changing

consumer demand.
    - As of March 2024, the country had approximately 1.76 million hectares of certified organic farming land, with an additional 3.63 million hectares under conversion to organic practices.
    - The market for organic products in India is set to reach **Rs. 75,000 crore (US$ 9.1 billion) by 2025.** In line with this, **India's organic exports have increased, with organic fruit exports growing 47.5% over the last five years**, showing robust international demand.
- **Livestock and Dairy Sector Renaissance:** India's dairy and livestock sectors have seen a boom due to increased production and global demand.
    - India remains the **world's largest milk producer**, contributing approximately 24% of global milk production.
        - The government's push for **infrastructure like milk chilling plants and cattle breed improvements** has positioned India as the world's largest milk producer.
    - The development of indigenous genomic chips like **"Gau Chip" and "Mahish Chip"** is helping accelerate the genetic improvement of Indian cattle and buffaloes.
- **Fisheries and Aquaculture Development:** The fisheries sector is emerging as a key growth area with the government investing heavily in infrastructure and sustainable aquaculture practices.
    - The **Pradhan Mantri Matsya Sampada Yojana (PMMSY)** is expected to boost fish production to 220 lakh tonnes by FY25.
    - Between 2014-15 and 2024-25, India's seafood exports grew by **60% in volume to** 16.85 lakh metric tonnes.
        - With initiatives like the **Fisheries and Aquaculture Infrastructure Development Fund (FIDF)**, India is positioning itself among world's largest seafood exporters.
- **Food Processing Sector Expansion**: The growth of the food processing sector in India is creating numerous opportunities for value addition, expanding both the domestic and export markets.
    - The sector is poised to grow to **Rs. 3.45 lakh crore (US$ 470 billion) by 2025,** driven by government initiatives like PMKSY and the **Production Linked Incentive Scheme for Food Processing Industry (PLISFPI) scheme.**
    - Also, the food processing sector is one of the largest employment providers in the organized manufacturing sector with **12.41% employment** in the total registered/organized sector as per the report of **Annual Survey of Industries (ASI), 2022-23.**
- **Strengthening Agricultural Research and Development:** Investment in agricultural R&D is playing a critical role in improving crop varieties, pest management, and climate resilience.
    - The government is focusing on advanced research in genetic improvements and alternative farming practices.
    - A major focus of R&D is the development of climate-resilient crop varieties. ICAR has been instrumental in creating these. In 2024, the **Indian Prime Minister unveiled 109 crop varieties** that are **high-yielding, climate-resilient, and biofortified**, aimed at enhancing agricultural productivity, nutritional security, and adaptability to climate stress.

## What are the Key Issues Hindering the Effectiveness of the Indian Agriculture System?

- **Structural & Resource-Based Issues (Affecting Production Capacity)**
    - **Fragmented Land Holdings:** The fragmentation of land holdings remains a significant barrier to agricultural productivity in India.
        - Small and marginal farmers, over **85% of India's agricultural population,** cultivate nearly **45% of the net sown area (Agricultural Census 2015-16)**. Yet, small landholdings yield insufficient returns for a decent livelihood.
            - **Small landholdings hinder mechanization,** lead to inefficient use of inputs, and lower overall productivity.
    - **Poor Irrigation Infrastructure**: Despite efforts like the **Pradhan Mantri Krishi Sinchai**

Yojana (PMKSY), Irrigation remains highly dependent on monsoons. About **61% of India's farmers rely on rain-fed agriculture and 55% of the gross cropped area is under rain-fed farming**, making it vulnerable to climate change.

- Inadequate irrigation infrastructure exacerbates water scarcity and limits crop production during dry periods.
- Land acquisition is a major bottleneck for large-scale irrigation projects. Also, the **heavy subsidies on power for agriculture have incentivized the over-pumping of groundwater,** further compounding the water scarcity issue.

- **Persistent Dependence on Chemical Fertilizers: Overreliance on chemical fertilizers,** while boosting yields in the short term, is causing long-term soil degradation and environmental damage.
  - India is the **second-largest consumer of fertilizers globally.** In 2023-24**,** the total annual consumption was around **601 lakh metric tonnes (LMT).**
    - **India's extensive use of fertilizers contributes to soil health depletion and has led to declining per hectare productivity in certain regions.**
- Also**, 100% of the country's Muriate of Potash (MOP)** and **about 60% of Di-Ammonium Phosphate (DAP) are imported.**
  - This makes India's fertilizer supply chain vulnerable to global price fluctuations and geopolitical events.
    - The **shift towards organic farming** and bio-fertilizers remains slow despite their proven benefits.
- **Climate Change and Environmental Stress:** India's agriculture is highly vulnerable to climate change, with irregular rainfall patterns, rising temperatures, and extreme weather events like droughts and floods adversely affecting crop yields.
  - This environmental uncertainty makes long-term agricultural planning difficult for farmers.
  - In 2023-24, **food grain production was low at 328.8 million tonnes,** primarily **because of poor and delayed monsoons,** showing the direct impact of climate unpredictability.
    - A recent study finds that, for wheat, **a 1 °C temperature increase would result in a 6.1% yield loss**.

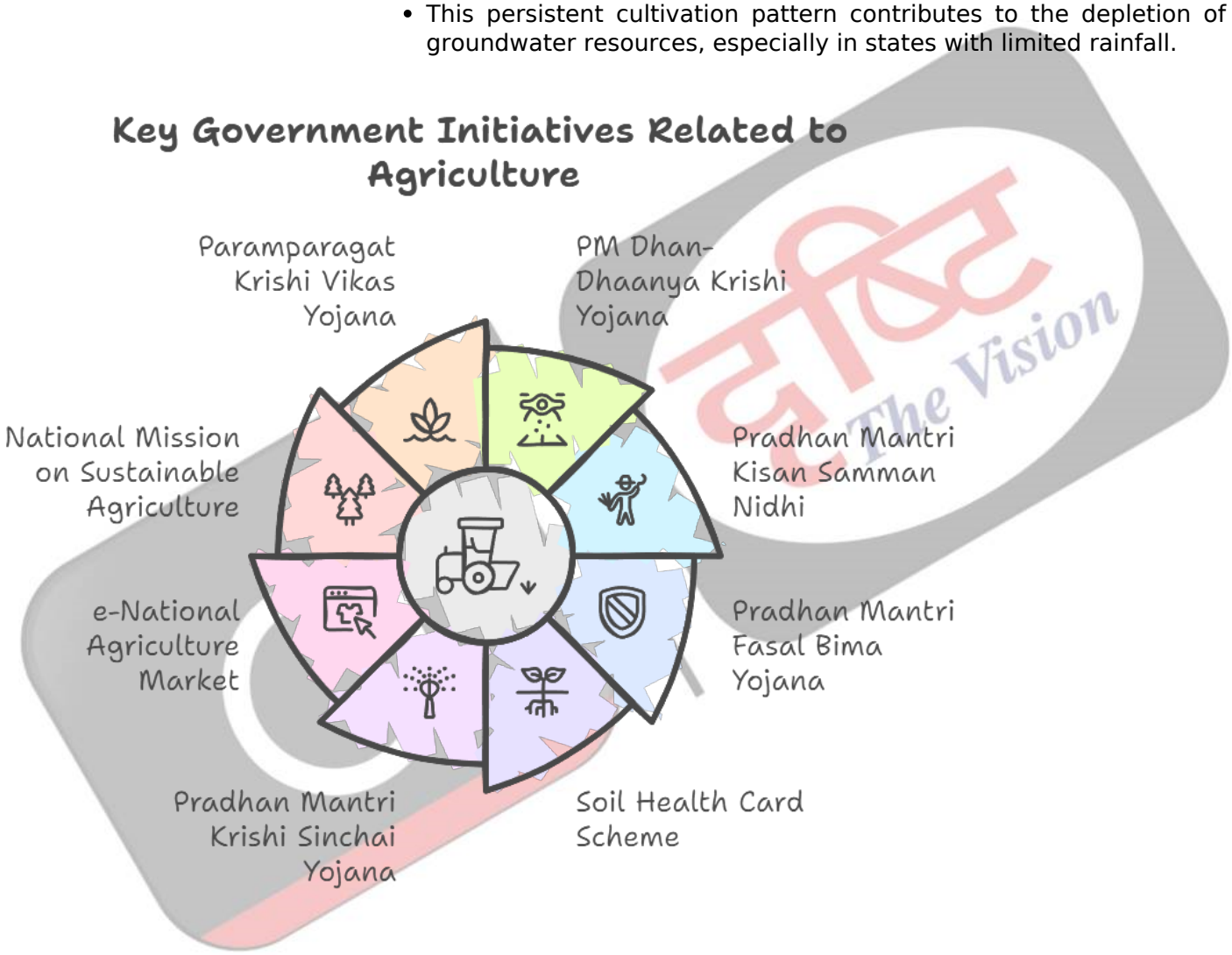
- **Institutional & Financial Constraints:**
  - **Lack of Even Access to Credit and Financial Support:** Access to timely and affordable credit remains a significant challenge for many farmers, especially smallholders.
    - Despite recent growth under the **Kisan Credit Card (KCC) Scheme,** credit distribution remains highly imbalanced. The **Southern region receives 47.13% of the total agricultural credit** but **only accounts for 16.96%** of the gross sown area.
    - Also, the **dependency on informal credit sources, which charge exorbitant interest rates,** keeps many farmers trapped in a cycle of debt.
  - **Minimum Support Price (MSP) Issues**: While the **Minimum Support Price (MSP)** system is designed to protect farmers from market price fluctuations**, it faces significant issues in implementation and effectiveness.**
    - The lack of **proper procurement infrastructure, delayed payments, and limited coverage of crops** undermine the MSP's effectiveness.
      - Although MSP is set for over 23 crops, **procurement is limited.**
    - **Farmers are demanding a legal guarantee for MSP**. However, a legal guarantee for MSP could have a direct impact on inflation.**Economists argue that setting prices above market rates could lead to food inflation** , which would disproportionately affect low-income consumer
    - Sometimes, **MSP, by guaranteeing a price, can distort market signals and create an artificial demand for certain crops.**
      - This can lead to an oversupply of these crops and a shortfall in others, resulting in price volatility in the open market.
- **Post-Production & Market-Linked Challenges**
  - **Inadequate Post-Harvest Infrastructure:** Post-harvest losses in India remain alarmingly

high due to a lack of adequate storage, transportation, and processing facilities.

- India suffers a **food loss of about ₹1.53 trillion every year** as per the latest large-scale study conducted by NABCONs during 2020 to 2022.
- **Horticultural crops (fruits, vegetables, plantations, and spices)** face the highest losses in terms of quantity.
- An estimated **30-40% of fruits and vegetables** are lost between harvest and consumption

◦ **Agronomic & Ecological Concerns**

- **Insufficient Crop Diversification:** The agricultural landscape, especially in the **"Green Revolution" states of Punjab, Haryana, and Western Uttar Pradesh**, is dominated by the paddy-wheat cropping cycle. This system accounts for a major portion of the country's food grain production.
  - Also, while the cultivation of water-guzzling crops like **sugarcane, rice, and cotton has increased,** there is a serious lack of incentives for farmers to shift to less water-intensive alternatives like **millets and pulses.**
    - This persistent cultivation pattern contributes to the depletion of groundwater resources, especially in states with limited rainfall.




## How can India Reimagine its Agricultural Sector to Align with the Goals of Viksit Bharat?

- **Land Consolidation via Digital Cooperative Farming Platforms: To overcome land fragmentation, India should promote Digital Cooperative Farming Platforms where smallholders voluntarily pool land and resources through smart contracts and blockchain-backed agreements.**

- These platforms can facilitate **shared mechanization, input procurement, and market access** while preserving ownership rights.

- Leveraging **FPOs** and **GIS-based land records,** the model can achieve economies of scale without legal consolidation. This ensures asset security while driving collective efficiency.

    - It modernizes land use without disrupting rural tenure dynamics.

- **Decentralized Micro-Irrigation Hubs through Panchayat-Level Water Councils:** To tackle poor irrigation infrastructure, **Water Resource Councils at the gram panchayat level** should be empowered to implement **cluster-based drip and sprinkler irrigation systems** using **solar-powered pumps and real-time soil moisture data.**

    - Integration with **PMKSY and MGNREGA** can fund community assets like micro-reservoirs and aquifer recharge structures.
    - **Water budgeting and local governance** will ensure efficient allocation. This strengthens climate resilience while ensuring equitable water access across fragmented holdings.
- **Soil Health Sovereignty through Region-Specific Bio-Input Parks:** Combatting fertilizer overdependence requires regionally customized **Bio-Input Parks** producing **biofertilizers, compost, and microbial consortia using local** organic waste.
    - These parks can be managed by FPOs with training from **ICAR-KVKs** and backed by **soil health cards** for targeted application.
    - Institutionalizing a **Bio-Input Certification System** will ensure quality and marketability. This decentralizes soil restoration while creating circular rural economies and reducing chemical load.
- **Hyperlocal Agri-Fintech Integration through Jan Dhan–KCC Linkages:** To improve credit access, launch hyperlocal agri-fintech models that integrate **Jan Dhan accounts, land records, KCC eligibility, and digital transaction histories** to generate automated credit scores.
    - Partnering with fintechs, these platforms can offer **risk-adjusted microcredit with embedded crop insurance.**
    - **Aadhaar-enabled, real-time disbursals will ensure financial inclusion for smallholders. It shifts agriculture finance from collateral-based to data-driven lending ecosystems.**

- **District-Level Climate-Contingent Crop Planning Cells:** To combat climate stress, set up District Climate-Contingent Planning Cells that use seasonal climate forecasts through agri-IoT, GIS analytics, and crop risk models to guide sowing, input use, and crop insurance targeting.

    - Adaptive plans will ensure crop alignment with forecast variability, reducing climate-induced income shocks. It institutionalizes agro-climatic risk intelligence at the local level.

- **Rural Agri-Logistics Nodes under Gati Shakti Framework:** Addressing post-harvest losses requires creating **Rural Agri-Logistics Nodes (RALNs)** integrated with the **PM Gati Shakti masterplan** to develop cold chains, aggregation centers, and packhouses near farm gates.
- These nodes must be digitally mapped and linked to e-commerce and export corridors.
- Priority should be given to perishable crop zones and tribal areas. This boosts value retention, reduces food waste, and makes farming export-aligned and market-resilient.
- **Nutritional Cropping Missions Anchored in Agri-Nutri Linkages:** To encourage crop diversification, India must launch Agri-Nutrition Missions promoting millets, pulses, oilseeds, and medicinal crops based on agro-ecological feasibility and nutritional needs.
    - State procurement policies must be reoriented to prioritize these crops in **PDS and mid-day meals**. Nutritional zoning will link soil health, diet security, and climate resilience.
        - This positions agriculture as a **public health enabler,** not just a food producer.
- **Agri-Mechanization as a Service (AMAAS) Ecosystem:** To scale modern farming, create an **Agri-Mechanization as a Service (AMAAS)** model where drone services, harvesters, and AI-based precision tools are **rented via digital platforms** managed by FPOs or rural startups.

- Capital subsidies can be linked to shared-use models rather than ownership. Backend integration with training and repair hubs ensures sustainability. This democratizes fourth-gen agriculture technologies for smallholders..
- **Smart Subsidy Transition Model through Direct Efficiency Incentives:** To address subsidy inefficiencies, develop a Smart Subsidy Transition Framework where input subsidies (e.g., fertilizer, water, power) are gradually shifted to direct efficiency-linked incentives.
    - Farmers adopting **soil-friendly inputs, micro-irrigation, and low-carbon practices** should be rewarded via **Digital Agriculture Benefit Transfers (DABT).**
    - This model ensures environmental stewardship while maintaining income support. It reorients subsidies towards **performance-based sustainability.**
- **MSP 2.0: Dynamic, Decentralized and Digitally Procured:** To reform MSP, create Dynamic MSP Platforms with district-specific floor prices based on real-time cost indices and climate forecasts.
    - Procurement should be expanded via **digital farmer registration, mobile-based receipts, and instant payments** through e-RUPI.
    - Diversify MSP coverage to include **pulses, oilseeds, and regionally relevant crops,** with decentralized procurement by SHGs and cooperatives. This builds a responsive, inclusive, and technology-driven price support system.
- **Agri-Tech Zones for Innovation-Led Farming:** Establish **Agri-Tech Innovation Zones (ATIZs)** in rural districts to pilot frontier technologies like **AI-based crop diagnostics, drone farming, and IoT-based irrigation.**
    - These zones can serve as **testbeds for public-private-CSR collaboration** under Startup India and Atal Innovation Mission. Institutionalizing **farmer–scientist–startup linkages** can accelerate tech absorption. Scaling these models across agro-climatic zones will mainstream **smart farming ecosystems.** This embeds innovation as a growth multiplier.
    - These nodes must be digitally mapped and linked to e-commerce and export corridors.

**Conclusion:**

- India's journey from a food-deficient economy to a global agricultural powerhouse now demands a leap from **food security to farmer prosperity, and from plough to platform.** To realise the vision of Viksit Bharat, agriculture must evolve into a **tech-integrated, climate-resilient, and value-driven sector.** This calls for a shift **beyond the Green Revolution to evergreen solutions**, where **soil meets software,** and **innovation coexists with inclusivity**. By **seeding Viksit Bharat from rural roots,** India can ensure that agriculture not only feeds the nation but also fuels its transformation into a developed economy.

***Drishti Mains Question:***

India's agriculture is transitioning from subsistence to a technology-driven and climate-resilient growth engine. Discuss the key developments driving this transformation and suggest measures to address the persistent challenges in aligning agriculture with the vision of Viksit Bharat.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### ***Prelims:***

Q. In the context of India's preparation for Climate -Smart Agriculture, consider the following statements: (2021)

1. The 'Climate-Smart Village' approach in India is a part of a project led by the Climate Change, Agriculture and Food Security (CCAFS), an international research programme.
2. The project of CCAFS is carried out under Consultative Group on International Agricultural Research (CGIAR) headquartered in France.
3. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in India is one of the

CGIAR’s research centres.

Which of the statements given above are correct?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans: (d)

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Q. Consider the following pairs: (2014)

Programme/Project Ministry

1. Drought-Prone Area Programme Ministry of Agriculture

2. Desert Development Programme Ministry of Environment and Forests

3. National Watershed Development Project for Rainfed Areas Ministry of Rural Development

Which of the above pairs is/are correctly matched?

(a) 1 and 2 only

(b) 3 only

(c) 1, 2 and 3

(d) None

Ans: (d)

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Q. In India, which of the following can be considered as public investment in agriculture? (2020)

1. Fixing Minimum Support Price for agricultural produce of all crops
2. Computerization of Primary Agricultural Credit Societies
3. Social Capital development
4. Free electricity supply to farmers
5. Waiver of agricultural loans by the banking system
6. Setting up of cold storage facilities by the governments

Select the correct answer using the code given below:

(a) 1, 2 and 5 only

(b) 1, 3, 4 and 5 only

(c) 2, 3 and 6 only

(d) 1, 2, 3, 4, 5 and 6

Ans: (c)

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***Mains:***

Q. Given the vulnerability of Indian agriculture to vagaries of nature, discuss the need for crop insurance and bring out the salient features of the Pradhan Mantri Fasal Bima Yojana (PMFBY). (2016)

Q. Explain various types of revolutions, took place in Agriculture after Independence in India. How have these revolutions helped in poverty alleviation and food security in India? (2017)