Enhancing Agricultural Productivity and Sustainability

This editorial is based on "Stopping short of the farm" which was published in The Indian Express on 03/01/2025. The article brings into focus the paradox of India's agriculture sector, where 46.1% of the workforce contributes only 17.7% to GDP. It critiques the FY26 budget's incremental approach and emphasizes the need for a shift from subsidies to investment-driven growth for long-term sustainability.

For Prelims: India's agricultural landscape, PM Krishi Sinchai Yojana, Atal Bhujal Yojana, NABARD, National Innovations in Climate Resilient Agriculture, Digital Public Infrastructure for Agriculture, e-NAM, ONDC, Kisan Credit Card, National Mission on Natural Farming, FPOs (Farmer Producer Organizations), Soil Health Card Scheme, National Mission on High-Yielding Seeds.

For Mains: Advancements in Indian Agriculture, Factors Hindering Agricultural Productivity and Efficiency in India.

India's agricultural landscape faces a complex set of challenges despite new budgetary initiatives for **FY26**. While the sector employs **46.1% of the workforce,** its GDP contribution has declined to **17.7%**, indicating declining productivity and farmer incomes. The budget's incremental approach, with just a **4% increase in allocation to Rs 1.49 trillion,** falls short of addressing structural issues like **inadequate R&D investment, post-harvest losses, and climate resilience needs.** The path forward requires a transformational shift from **subsidy-heavy interventions to investment-driven growth,** emphasizing private sector participation and technological advancement.

What are the Key Advancements in Indian Agriculture?

- **Expansion of Irrigation Infrastructure and Water Use Efficiency:** With 55% of India's net sown area under irrigation, the government is pushing for **micro-irrigation, watershed management, and solar-powered irrigation** to optimize water use.
    - Programs like PM Krishi Sinchai Yojana (PMKSY) and **Har Khet Ko Pani** are helping improve irrigation efficiency, particularly in drought-prone regions.
    - The Atal Bhujal Yojana is tackling groundwater depletion by promoting community-driven water conservation.
    - The Government of India established a **₹5,000 crore Micro Irrigation Fund (MIF)** with NABARD to help states expand micro irrigation coverage and mobilize resources.
- **Climate-Smart Agriculture and Resilience Building:** India is increasingly adopting climate-smart agricultural practices to enhance **resilience against extreme weather events, droughts, and soil degradation.**
    - Initiatives like the National Innovations in Climate Resilient Agriculture (NICRA) promote adaptive farming techniques, water conservation, and carbon sequestration.

        - The widespread adoption of drought-resistant crop varieties, precision farming, and agroforestry aligns with India's sustainability goals and helps mitigate climate risks.
            - In 2024, the Indian Prime Minister released **109 varieties of 61 crops** including 34 field crops and 27 horticultural crops.
- **Growth of Agri-Tech and Digital Farming:** The rise of **AI, IoT, satellite imaging, and blockchain in agriculture** is transforming farming practices through better weather prediction, soil health monitoring, and smart irrigation.
    - The **Digital Public Infrastructure for Agriculture (DPIA)** is integrating farm advisories, credit services, and market linkages into a single digital ecosystem.
    - Platforms like **AgriStack, e-NAM, and ONDC integration** are improving price discovery and supply chain efficiency.
    - **e-NAM** has linked 1.78 crore farmers and 2.62 lakh traders as of October 2024**.** Also**,** India is currently home to more than **3,000 agritech startups,** of which over 1,300 use emerging and disruptive technologies (EDTs)
- **Strengthening Agricultural Credit and Financial Inclusion:** Access to affordable credit has improved with **enhanced Kisan Credit Card (KCC) limits, priority sector lending, and interest subvention schemes**.
    - The Budget 2025-26 increased the **KCC limit from ₹3 lakh to ₹5 lakh**, enabling better access to working capital for 7.7 crore farmers. KCC accounts reached 7.75 crore as of March 2024.
    - The **PM Fasal Bima Yojana (PMFBY)** has expanded risk coverage, protecting farmers from climate shocks and has assisted 4 crore farmers till now.
- **Diversification Towards High-Value Crops and Allied Sectors:** Farmers are increasingly shifting from **rice-wheat monoculture to pulses, oilseeds, horticulture, and organic farming**, driven by better returns and climate resilience.
    - The **Atma Nirbhar Pulses Mission** and the **Mission for Fruits & Vegetables (₹500 crore allocation)** aim to boost production and reduce import dependence.
    - Allied sectors like **livestock (12.99% CAGR) and fisheries (184 LMT production in 2024)** are outpacing traditional farming.
        - During the last 7 years ending 2021-22, Food Processing sector has been growing at an **Average Annual Growth Rate (AAGR) of around 7.26%**
- **Sustainable Farming and Organic Agriculture Growth:** India is moving towards **natural, organic, and regenerative farming** with initiatives like **Paramparagat Krishi Vikas Yojana (PKVY), National Mission on Natural Farming (NMNF)**, and carbon farming incentives.
    - The push for **climate-smart agriculture and agroforestry** aligns with India's **net-zero commitments and SDG goals**. Organic food exports are rising, reflecting global demand for chemical-free produce.
    - As of March 2024, India has **1.76 million hectares under organic farming,** with 3.63 million hectares in transition to organic cultivation.
- **Policy Reforms and Trade Liberalization in Agriculture:** Government policies are focusing on **export promotion, import substitution, and FDI in agri-processing** to make India a global food hub.
    - The **increase in MSP for pulses and millets** ensures farmer profitability while encouraging sustainable crop choices.
    - Fisheries production reached **184 LMT in 2024.** Also, India's agri-food exports reached **$46.44 billion in FY24.**
- **Rural Employment and Skilling in Agriculture:** With **46.1% of India's workforce engaged in agriculture**, efforts are being made to increase productivity and incomes through skilling programs.
    - The **Rural Prosperity and Resilience Program**, announced in Budget 2025-26, aims to **reduce underemployment by integrating investment, technology, and skill development**.
    - Agri-MSMEs and **FPOs (Farmer Producer Organizations)** are being supported to create rural employment opportunities.
        - The government is aiming to meet the target of 10,000 new farmer producer organisations (FPOs) by the end FY25

What are the Factors Hindering Agricultural Productivity and Efficiency in India?

- **Declining Landholding Size and Land Fragmentation:** With **rising population pressure and inheritance laws**, Indian farms are becoming smaller and fragmented, reducing economies of scale and mechanization feasibility.
    - Small landholdings make **modern irrigation, high-tech farming, and precision agriculture** less viable, affecting overall productivity.
        - The absence of a **vibrant land leasing market** and restrictive land tenure laws further deter large-scale investment in agriculture.
    - **Land pooling mechanisms and cooperative farming models** can offer solutions, but adoption remains slow.
    - **86.1% of Indian farmers** are small and marginal (SMF) ie, have a landholding size smaller than 2 hectares.
        - The average farm size declined from 2.28 hectares (1970-71) to **1.08 hectares (2015-16).**
- **Overdependence on Monsoon and Low Irrigation Coverage:** Despite progress, **India's agriculture remains highly monsoon-dependent**, making it vulnerable to erratic rainfall and climate change.
    - Only **55% of net sown area is irrigated**, leaving the remaining **45% exposed to drought risks**.
        - Traditional irrigation systems are inefficient, with high water wastage due to poor canal maintenance.
    - While **PM Krishi Sinchai Yojana (PMKSY) and micro-irrigation initiatives** aim to improve water use efficiency, adoption remains slow due to **high initial costs and lack of awareness**.
    - A recent survey by the Forum of Enterprises for Equitable Development (FEED) found that **drought (41%), irregular rainfall (32%), and timing issues with monsoons (24%)** were the main causes of crop damage.
        - Nearly 43% of farmers reported losing at least half of their crops.
- **Soil Degradation and Declining Soil Fertility:** Excessive use of **chemical fertilizers, pesticides, and monoculture cropping (especially rice and wheat)** has depleted soil nutrients and degraded land.
    - Intensive **Green Revolution practices** have led to **salinity, waterlogging, and loss of organic carbon**, reducing soil productivity.
        - Though initiatives like **Soil Health Card Scheme and Natural Farming Mission** promote sustainable practices, their adoption remains limited.
    - About **1 millimetre of topsoil** is lost annually in India due to soil (water) erosion at an average rate of 16.4 tons per hectare per year.
- **Low Investment in Agricultural Research and Development (R&D):** Agricultural productivity in India lags due to **low R&D spending, limited extension services, and inadequate technology adoption**.
    - While high-yielding and climate-resilient crops are crucial for sustainable growth, **investment in seed research and biotechnology remains below global benchmarks**.
    - Currently, India invests **less than 0.5% of its agricultural GDP in R&D,** a figure that pales in comparison to global benchmarks.
- **Inefficiencies in Agricultural Marketing and Price Realization:** Farmers receive only **30-40% of the final consumer price**, as inefficient **APMC markets, excessive middlemen, and poor logistics** reduce their earnings.
    - Weak **market linkages, lack of processing infrastructure, and fragmented value chains** further impact profitability.
    - India suffers a food loss of about **Rs. 1.53 trillion** every year as per the latest large-scale study conducted by NABCONs during **2020 to 2022.**
- **MSP-Centric Procurement and Lack of Crop Diversification:**The **MSP system is skewed towards rice and wheat**, discouraging farmers from growing pulses, oilseeds, and high-value crops.
    - This leads to **water-intensive farming, soil degradation, and market imbalances**, with excess grain stocks and insufficient pulses/oilseeds production.
        - While the **Atma Nirbhar Pulses Mission** and **crop-neutral incentive proposals** aim to address this, a significant policy shift is required.
- **Low Mechanization and Farm Technology Adoption:** A 2022 report reveals that only 47% of

agricultural operations in India are mechanized, lagging behind developing nations like **China (60%) and Brazil (75%)** in farm mechanization.
    - Small farm sizes, high machinery costs, and lack of affordable financing hinder mechanization.
    - The push for **drones, AI-driven precision farming, and IoT-based smart irrigation** under **Digital Public Infrastructure for Agriculture (DPIA)** is promising, but widespread adoption is slow.
- **Disguised unemployment and Stagnant Farm Wages:** Despite declining agriculture's **GDP share (16% in FY24), its workforce share increased to 46.1%**.
    - Low farm wages and disguised unemployment persist due to the **inability of urban sectors to absorb surplus labour**.
    - Real rural wages remained stagnant in FY24; majority of agricultural employment comprises farm labourers, often earning below minimum wage.

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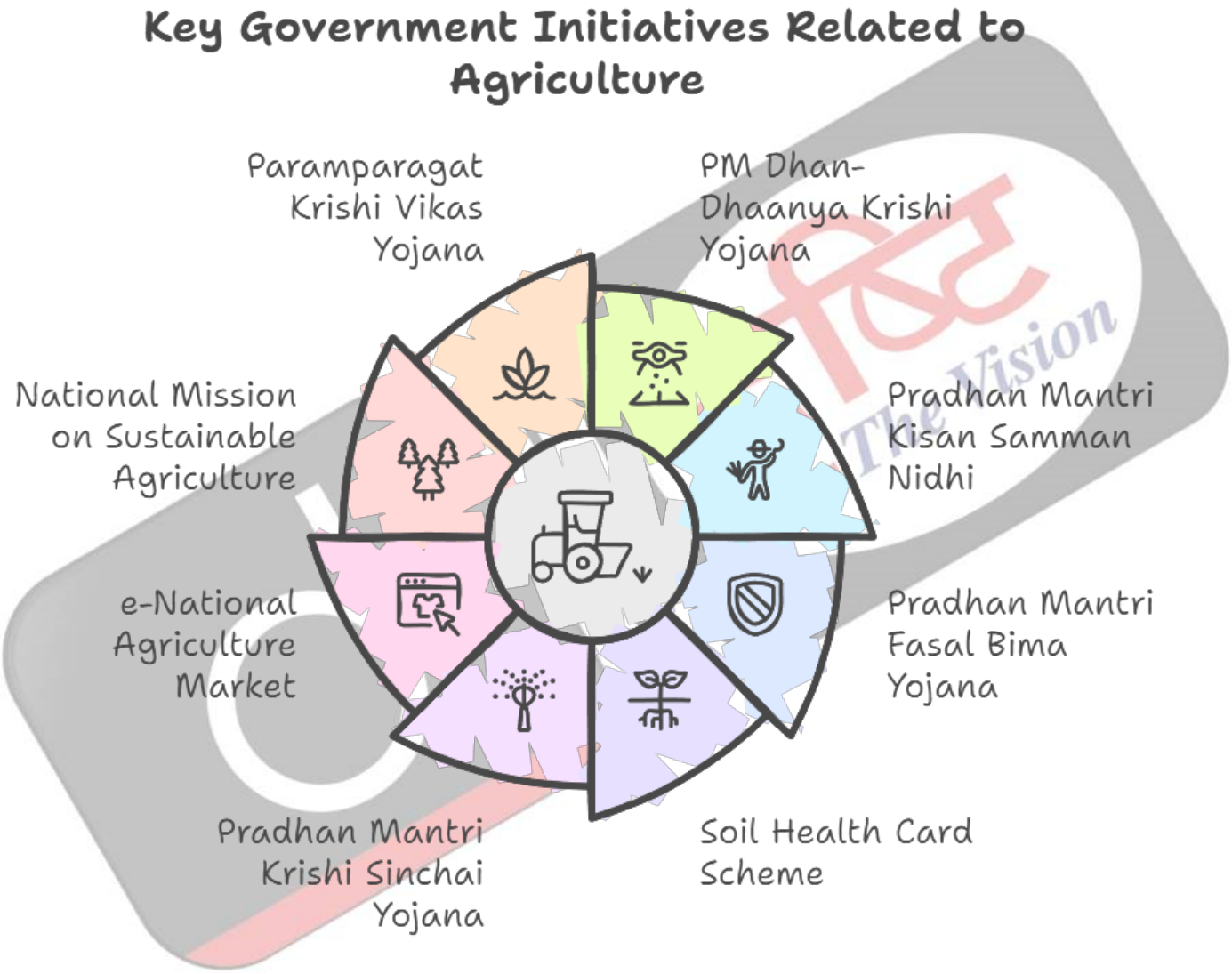

What Measures can be Adopted to Enhance Agricultural Productivity and Efficiency in India?

- **Land Consolidation and Promotion of Cooperative Farming:** Fragmented landholdings reduce mechanization, efficiency, and economies of scale.
    - **Land pooling mechanisms, cooperative farming models, and digitization of land records** can enable small farmers to access modern technologies and credit.

        - Encouraging **contract farming and** **Farmer Producer Organizations (FPOs)** can improve collective bargaining power and market linkages.
    - **Streamlining land leasing laws** will ensure better land utilization without ownership disputes.
        - **Budget 2025-26**'s focus on land digitization is a step forward.
- **Expanding Micro-Irrigation and Watershed Development:** Irrigation efficiency is critical as **45% of India's farmland still relies on monsoon**.
    - **Drip and sprinkler irrigation, treated wastewater reuse, and decentralized rainwater harvesting** must be scaled up, especially in semi-arid regions.
        - **Integration of PM Krishi Sinchai Yojana (PMKSY) with Atal Bhujal Yojana** can ensure both groundwater conservation and efficient irrigation.
    - Incentivizing **solar-powered irrigation pumps** will further reduce dependence on diesel-based water extraction.
- **Strengthening Agri-R&D and Climate-Resilient Farming: I**ncreasing investment in public-private partnerships for biotech research, precision agriculture, and AI-driven farm advisories is crucial.
    - Programs like the **National Mission on High-Yielding Seeds** should be expanded to focus on pulses and oilseeds.
    - **Integrating climate-resilient seed varieties with PM Fasal Bima Yojana (PMFBY)** will enhance productivity while mitigating climate risks.
- **Enhancing Agricultural Credit and Financial Inclusion:** Increasing institutional credit penetration, streamlining Kisan Credit Card (KCC) access, and linking it with digital platforms like **AgriStack** will ensure financial stability for farmers.
    - The **KCC limit increase from ₹3 lakh to ₹5 lakh** is a positive step, but rural banks and cooperative societies need to be strengthened.
    - Developing **crop-specific insurance products under PMFBY** will protect against market fluctuations.
- **Revamping Agricultural Marketing and Strengthening e-NAM:** Recent studies show that farmers receive **only 33% of the consumer price for tomatoes**, 36% for onions, and 37% for potatoes.
    - Integrating e-NAM with ONDC, promoting **direct farm-to-market models, and expanding Farmer Producer Organizations (FPOs)** will ensure better price realization.
    - Investing in **rural logistics, cold storage, and warehousing under Agriculture Infrastructure Fund (AIF)** is essential to reduce post-harvest losses.
    - **Agri-export zones and cluster-based farming models** can make India a global food supplier.
- **Diversification Towards High-Value and Climate-Smart Crops:**Overdependence on rice and wheat depletes soil health and leads to overproduction, straining MSP procurement.
    - **Promoting pulses, oilseeds, millets, horticulture, and agroforestry** can boost incomes and sustainability.
    - **Aligning Atma Nirbhar Pulses Mission with crop-neutral incentives** will help reduce import dependence.
    - Developing **organic farming clusters and GI-tagged regional crops** can create export opportunities.
- **Strengthening Sustainable and Natural Farming Practices:**Chemical-intensive farming has degraded soil and water quality, necessitating a shift towards **zero-budget natural farming, agroforestry, and bio-fertilizers**.
    - Linking **carbon credit markets with sustainable farming incentives** can provide additional income sources for farmers practicing regenerative agriculture.
    - Government initiatives like the **National Mission on High Yielding Seeds** and **PM Dhan-Dhaanya Krishi Yojana** aim to boost output in low-productivity districts.
- **Reducing Post-Harvest Losses:** Investing in modern storage, cold chains, and rural food processing parks will minimize losses and create value-added agri-products.
    - Strengthening **PM Kisan Sampada Yojana** **and linking it with the Horticulture Mission** can boost processing capacity.
    - Private sector participation in storage infrastructure through viability gap funding should be encouraged.

Conclusion:

While India's agricultural sector has made progress **but faces challenges like land fragmentation, monsoon dependence, and soil degradation**. To unlock its full potential, India needs to focus on **sustainable practices, climate-resilient technologies, better infrastructure, and policy reforms**. Enhancing private sector involvement and improving agricultural marketing can ensure food security, higher farmer incomes, and long-term growth.

Drishti Mains Question:

What are the key challenges hindering agricultural productivity in India, and how can technological innovations, policy reforms, and sustainable practices address these issues?

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)

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)

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)

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)
