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Revitalizing Indian Agriculture for Resilience and Growth

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ABSTRACT

India's agriculture and allied sectors have demonstrated sustained resilience and steady growth, emerging as a central pillar of rural livelihoods and inclusive economic expansion, according to the Economic Survey 2025–26. Agriculture and allied activities contribute nearly one-fifth of national income at current prices and remain critical given their large share in employment. Over the past five years, the sector recorded an average annual growth rate of 4.4% at constant prices, while decadal growth between 2016 and 2025 stood at 4.45%, the highest compared with previous decades. Growth has increasingly been driven by allied sectors. Livestock recorded a compound annual growth rate of 12.77% at current prices between 2015 and 2024, with gross value added (GVA) rising by nearly 195%. Fisheries and aquaculture also expanded strongly, with fish production increasing by over 140% between 2014 and 2025. These segments have emerged as key contributors to farm incomes and rural employment diversification. Food grain production reached a record 362.96 metric tonnes (mt) in 2024–25, an increase of 25.43 mt over the previous year, led by higher output of rice, wheat, maize and coarse cereals. At the same time, the survey highlights the growing importance of horticulture, which now accounts for around 33% of agricultural GVA. Horticulture production rose from 280.70 mt in 2013–14 to 370.85 mt in 2024–25, with fruits, vegetables and other horticultural crops showing broad-based expansion. The government's objective of doubling farmers' incomes has been through productivity enhancement and policy and institutional interventions. Key initiatives include expanded irrigation coverage, improved seed quality, soil health management, farm mechanisation, crop insurance and market access reforms. Gross irrigated area as a share of gross cropped area increased from 41.7% in 2001–02 to 55.8% in 2022–23, while over 25.55 crores Soil Health Cards (SHC) have been issued to promote balanced nutrient use. Efforts to reduce import dependence have also gathered momentum. Domestic edible oil availability increased to 121.75 lakh tonnes in 2023–24, reducing reliance on imported edible oil. A mission-mode push for self-sufficiency in pulses was approved in October 2025 to raise productivity and stabilise supplies. Crop insurance coverage expanded sharply, with 4.19 crore farmers insured in 2024–25, a 32% increase over 2023. Income support through direct transfers and higher minimum support prices continued to provide stability amid weather and market risks.

Keywords: Agriculture sector, Economic growth, Agristack, Agricultural growth and resilience, Artificial intelligence, Digital intelligence

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INTRODUCTION

India's agriculture is undergoing a quiet structural transition from a subsidy-centric, production-focused system to one increasingly shaped by infrastructure, logistics, and digital governance. Budget 2026–27 deeper push to ports, warehousing, AI-enabled advisories, and export facilitation is redefining how farm value is created and captured. This reflects a policy shift from farm support to market enablement, with implications for income stability, diversification, and global competitiveness. However, muted investments in irrigation and agricultural R&D raise concerns about resilience in an era of climate volatility and resource stress. India's economy delivered a surprising 7.8% GDP growth in the first quarter, the highest in five quarters (April-June 2025), driven by broad-based expansion across agriculture, manufacturing, and services sectors. However, this strong performance faces significant headwinds from US trade tariffs that could impact 66% of Indian exports with levies of 50% or higher. Additional concerns include low nominal GDP growth at 8.8% could complicate fiscal management. In this environment of mixed signals and external pressures, the Indian economy needs greater resilience to navigate the challenging path ahead.

Shaping India's Agriculture Sector

Strategic Pivot to High-Value Plantation Crops: Moving beyond food security staples, the Budget 2026-27 aggressively promotes high-value "money crops" to boost farm incomes and reduce import dependence. The policy targets coastal and hill economies specifically, incentivizing the cultivation of nuts and plantation crops to capture premium global markets

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and create import substitution for raw materials like cocoa and cashew. For instance, the Budget has called for a dedicated Coconut Promotion Scheme. To rejuvenate old, low-yielding orchards and expand high-density cultivation of walnuts, almonds and pine nuts, the Budget proposes to support a dedicated programme to enhance farmer incomes and in bringing value addition by engaging youth. Also, under the National Fibre Scheme, focus has been placed on fibres such as silk, wool and jute, which will provide direct benefits to farmers associated with these sectors.

AI-Integrated Digital Extension: The launch of "Bharat-VISTAAR" marks the transition from static data collection to active, AI-driven advisory services. By integrating the "AgriStack" (farmer registry) with ICAR's scientific data, this multilingual platform aims to democratize precision farming, offering real-time, location-specific advice to bridge the massive lab-to-land information gap. The Budget 2026 allocated ₹150 crore specifically for Bharat-VISTAAR to operationalize this AI framework.

Structural Shift to Allied Sectors: The Economic Survey 2025-26 highlights a decisive structural transformation where livestock and fisheries are becoming the primary engines of agricultural growth, outpacing the crop sector. This "diversification by default" acts as a vital insurance against monsoon volatility, stabilizing rural incomes even when traditional crop outputs decelerate. For instance, Livestock recorded a 12.77% CAGR at current prices between 2015–2024, with GVA rising nearly 195%. Moreover, fish production has increased to 19.78 mt in 2024-25 from 9.58 mt in 2013-14, boosting rural incomes and employment diversification.

Blue Economy ***Integration & Value Chain Expansion:*** The government is industrializing the fisheries sector by integrating inland water bodies into formal value chains to boost "Blue Growth." The focus has shifted from mere catch volumes to processing and export competitiveness, treating fishing vessels as effectively "mobile export units" to maximize foreign exchange earnings. For instance, Budget 2026 proposes integrating 500 reservoirs and *Amrit Sarovars* into the fisheries value chain. It also declared fish catch by Indian vessels in the Exclusive Economic Zone (EEZ) as duty-free, aiming to boost marine exports.

***Export Resilience Amidst Protectionism*:** Despite global trade barriers and tariff wars, Indian agri-exports have shown remarkable resilience, pivoting towards non-traditional markets and processed goods. The strategy involves decoupling from volatile bulk commodities (like wheat) to focus on high-value, tariff-resilient products like coffee and processed fruits, ensuring trade surplus continuity. For instance, during the financial year 2024-25, India's coffee exports reached $1.80 billion, marking a 40.2% growth over the $1.28 billion achieved in 2023-24. Also, India is the world's largest producer of millets with a share of 38.4% of world's production (FAO, 2021).

Institutionalizing Natural Farming : The push for Natural Farming has moved from a pilot project to a "*Jan Bhagidari*" (mass movement) to permanently reduce the fertilizer subsidy burden and restore soil health. However, the approach is now cluster-based and market-linked, aiming to create a distinct value chain for chemical-free produce rather than just an input-reduction strategy. The National Mission on Natural Darming (NMNF) received ₹750 crore in Budget 2026-27 to support bio-input resource centres. It aims to cover 1 crore farmers to supply the growing organic export market.

***Women at the Helm of India's Precision Farming Revolution*:** Namo Drone Didi Scheme is successfully creating a new stratum of "rural technical workforce" among women, addressing both labour shortages and the need for precision application of nano-fertilizers. It represents a sociological shift where women are not just farm laborers but asset owners and technology providers, altering the power dynamics in rural agrarian economies. With a ₹1,261 crores outlay, the scheme is deploying 15,000 drones to Women SHGs. These drones cover 1 acre in 7 to 8 minutes, allowing SHGs to earn rental income while reducing fertilizer consumption through precise spraying. Also, the Union Budget has proposed SHE-Mart to promote Self-Help Entrepreneurs, establishing community-owned retail outlets in every district to market products made by women and SHGs, enabling women in agriculture, animal husbandry, and allied sectors to transition from subsistence work to entrepreneurship.

***The Collectivization Wave via FPOs*:** Smallholder fragmentation is being aggressively countered by the "10,000 FPO" scheme, which is successfully shifting farmers from "price takers" to "price makers" through collective bargaining. This institutional innovation is now maturing, moving beyond mere registration to actual business integration, enabling direct market linkages and value addition at the farm gate. As of December 2025, ₹430.77 Crore has been distributed to 6,557 FPOs as a matching equity grant and credit guarantee cover worth ₹662.71 Cr is issued to 2,671 FPOs.

Key Issues Associated with India's Agriculture Sector

Adverse Global Trade Environment: India's trade landscape is increasingly burdened by escalating global protectionism and geopolitical conflicts. The US has imposed steep 50% tariffs on Indian goods, signalling Washington's displeasure over Delhi's continued oil and defence ties with Russia. These tariffs also threaten key sectors like textiles, engineering goods, and chemicals, undermining growth prospects. Also, Indian export growth dropped sharply to 3.9% in Q4 2024,

from 7.4% in the previous quarter. This significantly hampers India's ability to remain competitive in critical markets.

Global Inflation and Commodity Price Shocks: Rising global inflation, largely driven by surging oil and food prices, is putting immense pressure on India's domestic prices (Imported Inflation). For instance, imported inflation surged in India, rising from 1.3% in June 2024 to 31.1% in February 2025, driven by rising prices of precious metals, oils, and fats. This, in turn, leads to higher inflationary pressures, which could breach the RBI's target range of 4-6%. The challenge for India is to balance monetary easing to stimulate growth while managing rising inflation due to global supply shocks.

Geopolitical Risks and Supply Chain Disruptions: Geopolitical risks, particularly arising from tensions in Europe and the Indo-Pacific, have led to persistent disruptions in global supply chains. For India, this has meant higher costs for imported raw materials and intermediate goods. The Economic Survey 2024-25 highlighted that escalating global geopolitical tensions, ongoing conflicts in the Red Sea region disrupting major shipping lanes, and protectionist trade policies have elevated transport costs and created uncertainty in supply chains.

Tightening Global Financial Conditions and Rupee Depreciation: The tightening of global financial conditions, especially from the US Federal Reserves interest rate hikes, is exerting pressure on the Indian rupee. The Indian rupee plummeted to a record low of 88.36 against the U.S. dollar due to concerns over potential U.S. tariffs on India. As the rupee depreciates, India's ability to manage external debt and maintain the stability of its foreign exchange reserves becomes even more challenging, raising concerns over fiscal and financial stability.

Slow Global Recovery and Delayed Trade Agreements: While India is making efforts to diversify its trade partners through deals with regions like the EU and US, geopolitical disruptions and delayed trade agreements are slowing down the pace of these negotiations. The India-EU FTA is yet to be finalized. Similarly, trade negotiations between India and Canada have experienced a long pause, mainly due to diplomatic tensions. This delay is largely attributed to complex issues such as data protection, intellectual property rights, and trade tariffs, alongside diplomatic disagreements over human rights and environmental standards.

Decline in Foreign Direct Investment (FDI) from Global Uncertainty: The global economic slowdown and investor uncertainty, exacerbated by trade tensions and geopolitical risks, have led to a decline in FDI inflows into India. RBI data shows net FDI inflows plunged to just $35 million in May 2025, down sharply from $2.2 billion a year ago. This decline in foreign investment makes it difficult for India to meet its infrastructure and development goals. This drop in foreign capital undermines the Indian rupee and threatens to destabilize financial markets, adding pressure to India's external debt and forex reserves.

Disruptions in Global Energy Supply Chains: India's energy sector is under strain due to global energy supply disruptions, primarily due to geopolitical tensions and fluctuations in global oil prices. With India importing 80% of its oil, any significant rise in energy prices, as seen in 2025, adds substantial pressure on the fiscal deficit and inflation. This in turn raises input costs for industries, undermines consumer purchasing power, and hampers growth momentum. The pressure on the balance of payments also increases, as higher import bills strain foreign exchange reserves. These dynamics highlight the urgency for India to accelerate its transition towards renewable energy, strengthen strategic oil reserves, and diversify energy partnerships.

The "Climate-Insurance" Asymmetry: A critical policy paradox exists where the frequency of extreme weather events is outpacing the state's fiscal capacity for compensation. While the "climate shock" has become a permanent feature disrupting crop cycles, the budgetary allocation for insurance (PMFBY) is seeing real-term consolidation, forcing a reliance on "adaptation" over "compensation," which leaves smallholders vulnerable to immediate liquidity crunches. For instance, in 2025, India faced extreme weather on 331 of 334 days, damaging 17.4 m ha of crop area. Yet, the Budget 2026-27 allocated ₹12,200 crore for PMFBY, a reduction from revised estimates.

Disguised Unemployment & Labour Stagnation: Despite the structural transformation of the broader economy, the agriculture sector continues to absorb a disproportionate share of the workforce, signalling "disguised unemployment." The failure of the manufacturing sector to pull labour out of farms has led to a scenario where rising agricultural output does not translate into rising per-capita farm income, as the revenue pie is shared among too many dependents. The Periodic Labour Force Survey (FLFS) 2025 revealed that 57.7% of the rural workforce is still engaged in agriculture, an increase from previous years, this effectively suppresses rural wage growth.

Skewed NPK Ratio & Soil Fatigue: The heavy subsidization of urea has distorted the nutrient application ratio, leading to severe soil toxicity and stagnation in yield growth ("soil fatigue"). Farmers over-apply cheap nitrogen while neglecting phosphorus and potassium, creating a "yield barrier" where applying more fertilizer no longer results in proportional crop output, threatening long-term food security for short-term gains. For instance, the Economic Survey 2025-26 flagged the N:P: K consumption ratio at a skewed 10.9:4.1:1

(against the ideal 4:2:1).

The MSP-Procurement Disconnect: The demand for a "Legal Guarantee for MSP" stems from the market failure where open market prices often crash below production costs during peak harvest. However, the current procurement infrastructure is heavily skewed towards wheat and rice in limited geographies (Punjab, Haryana), leaving farmers of pulses, oilseeds, and coarse grains in other states effectively outside the safety net despite "paper MSPs." For instance, while the government announced MSP hikes for 22 crops in 2025-26, actual procurement remained negligible for crops like oilseeds.

Fragmentation & Scale Inefficiency: The continuous subdivision of land across generations has reduced the average operational holding to a size where mechanization becomes economically unviable. This "atomization" of land prevents economies of scale, making modern inputs (like precision irrigation or harvesters) too costly for the individual farmer, thereby trapping them in a low-input, low-output equilibrium. The average landholding size has shrunk to 1.08 hectares (2025 estimate), with 86% of farmers being Small & Marginal. Lower farm machinery utilization on these small plots is driving up production costs.

Post-Harvest "First-Mile" Gaps: While cold chain capacity is growing, the critical "first-mile" connectivity (farm gate to aggregation point) remains broken. Most post-harvest losses occur immediately after cutting due to a lack of near-farm packhouses and pre-cooling units, forcing farmers into "distress sales" to local traders rather than holding produce for better prices in the organized market. For instance, India loses approximately ₹92,651 crore annually to post-harvest losses (CIPHET data).

Edible Oil & Pulse Import Dependency: A major strategic vulnerability is India's continued reliance on global markets for essential proteins and fats. Despite "Mission Mode" interventions, domestic production of oilseeds and pulses fluctuates wildly with the monsoon, forcing the government to rely on zero-duty imports to control inflation, which paradoxically depresses domestic prices and discourages farmers from expanding acreage. For instance, India imported 16 million tonnes of edible oils for nearly Rs 1.61 lakh crore during the 2024-25 marketing year ended October to meet domestic demand, exposing vulnerability to global price volatility and forex outflows. Maharashtra's tur (pigeon pea) output for the 2025–26 season was projected to fall by up to 40% due to severe crop damage caused by excessive rainfall, flooding, and waterlogging, potentially triggering a rise in imports to bridge the supply shortfall.

Groundwater Depletion & Energy Nexus: The free power policy for tube wells in major agrarian states has created a perverse incentive to mine groundwater, leading to an ecological crisis. This "Energy-Water nexus" encourages the cultivation of water-guzzling crops like paddy in semi-arid regions, depleting aquifers at a rate that is irreversible and effectively exporting water from dry states to the rest of the world. For instance, the Dynamic Ground Water Resource Assessment 2025 shows 10.8% of units (730 of 6,762) are over-exploited, while total stressed units (over-exploited, critical, and semi-critical) together account for ~25%. Also, while about 70% of Indian electricity is carbon-based, a quarter of the nation's consumption goes into agriculture. (Centre for Policy Research)

Geo-economic Disruptions Present for India

Diversification of Trade Partners and Supply Chains: Geo-economic disruptions, such as the shifting global trade dynamics and supply chain reconfiguration, present India with an opportunity to become a key player in alternative trade routes and global value chains. With Western countries increasingly looking for alternatives to China, India can position itself as a reliable manufacturing and sourcing hub. India's "Make in Indian" and "Atmanirbhar Bharat" policies are strategically aligned with this shift. Also, these disruptions can push India to secure new trade deals, particularly with the Latin America, Africa and ASEAN countries, positioning India as a trusted manufacturing partner.

Potential for Growth in Digital Economy and Tech Exports: The ongoing global shift towards digital transformation and remote work creates a significant opportunity for India to enhance its leadership in the global tech services sector. India's deep talent pool in IT and business process outsourcing (BPO) is already well-positioned to meet rising global demand for cloud computing, AI, and cybersecurity services. India's IT industry is likely to hit the USD 350 billion mark by 2026 and contribute 10% towards the country's gross domestic product (GDP). Also, platforms like the Unified Payment Interface (UPI) and Aadhaar have not only revolutionized domestic transactions but are also being adopted as a blueprint by other countries.

Strategic Positioning in Global Energy Transition: The global push towards a low-carbon economy offers India the chance to become a leader in renewable energy and energy storage technologies. India's vast renewable energy potential, particularly in solar and wind, positions it as a key player in the energy transition. The total installed renewable energy (RE) capacity in the country has reached 220.10 GW as of March 2025. The country's ongoing efforts to scale green hydrogen production and battery storage technology could make India an exporter of green energy to global markets. With global demand for clean energy solutions growing, India

can capitalize on this opportunity to meet both domestic energy needs and become a supplier of sustainable solutions worldwide.

Strengthening Regional Leadership in South Asia: Geo-economic disruptions offer India the opportunity to solidify its position as the leading economic and strategic power in South Asia. As global focus shifts towards Indo-Pacific stability, India can expand its influence by fostering deeper economic ties with its neighbouring countries, such as Bangladesh, Sri Lanka, and Nepal. India's $1 billion line of credit to Sri Lanka in 2023, as well as growing trade and infrastructure investments in Bangladesh and Nepal, strengthen its role as a regional leader. India can leverage these partnerships to create regional economic blocs, reducing reliance on unstable global supply chains and ensuring its strategic autonomy.

Potential for in Global Defence and Aerospace Partnerships: As global defence strategies shift towards self-reliance and diversification away from traditional powers. India has the opportunity to expand its role as a defence manufacturer and strategic partner in global security. India's "Make in India" initiative for defence, combined with its growing military-industrial complex, positions it as a key partner in the Indo-Pacific region. India's defence exports grew over 34 times between FY 2013–14 and FY 2024–25, signalling growing global demand for its defence technologies.

Emergence as a Global Leader in Semiconductor Manufacturing: With the ongoing global chip shortage and increasing reliance on semiconductors for everything from automobiles to consumer electronics, India has a significant opportunity to develop its semiconductor manufacturing capabilities. The central government has launched the SEMICON India Program with an investment of ₹76,000 crore, implemented through the India Semiconductor Mission (ISM), which is a strategic step to attract global players and build a domestic chip manufacturing ecosystem. Global demand for semiconductors is expected to reach $1 trillion by 2030, and India's focus on advanced manufacturing technologies and skilled labour positions it as a potential hub for semiconductor fabrication plants. As countries diversify supply chains away from China, India can emerge as a key player in the global chip market.

Navigating Indian Agriculture's Growth & Resilience

Giving a strong emphasis on productivity, resilience and inclusive growth, the GoI's Budget again reinforces agriculture as a key pillar in India's journey towards *Viksit Bharat*. It pushes productivity, technology, and resilience in Agriculture. The targeted attention on livestock, fisheries and allied sectors showcases a clear shift towards diversified and income-resilient farm systems. In this context, the new loan linked capital support for veterinary education, hospitals, diagnostics and breeding infrastructure would expand capacity and high-quality services across rural India. Additionally, future science-led interventions in the areas of cattle genetics and breeding would help accelerate livestock productivity and farm incomes. It is also encouraging to see the Government's focus on leveraging technology-driven agriculture through the introduction of multilingual AI platform. Amidst evolving climate and market conditions, delivering customized and risk-aware advisory at a scale is need of an hour to empower farmers to make informed decisions and adapt better. We also appreciate the extension of tax deduction to primary co-operatives supplying cattle feed and cotton seed to federal co-operatives and government organisations, which will strengthen formal input supply chains and improve farmer realization. Together, through a calibrated approach by integrates productivity, innovation, inclusion, and institutional support, this year's Budget once again lays a strong foundation for a future ready agricultural ecosystem and reinforces agriculture's role as a long-term contributor to India's economic growth.

The Economic Survey of India (ESI) - 2026 also stated that agriculture sector has demonstrated resilience, registering steady growth with major growth coming from the Allied sector. It asserted that country's agri sector is crucial to achieving the government's vision of a *Viksit Bharat* by 2047, and it faces significant sustainability and productivity challenges despite recent growth. Over the last five years, the agriculture and allied sector has registered the average annual growth rate of around 4.4% at constant prices. In Q2 2025-26- the agriculture sector registered a growth of 3.5%. The decadal growth of 4.45% (2016-2025), the highest in comparison to previous decades, has primarily resulted from the strong performance in livestock (7.1%) and fishing and aquaculture (8.8%), followed by the crop sector at 3.5%. The Economic Survey advocated for advancement in the fertiliser sector, boosting research and development, strengthening irrigation systems and promoting crop diversification. Agriculture will be central to achieving *Viksit Bharat*, driving inclusive growth and improving the livelihoods of millions. ESI (2025-26) highlights the sustained resilience and steady growth of India's agriculture sector, which is increasingly driven by allied activities like livestock and fisheries. India's agriculture and allied sectors have demonstrated sustained resilience and steady growth, emerging as a central pillar of rural livelihoods and inclusive economic expansion. The survey notes that agriculture and allied activities contribute nearly one-fifth of national income at current prices and remain critical given their large share in employment. Over the past five years, the sector recorded an average annual growth rate of 4.4% at constant prices, while decadal growth between 2016 and 2025 stood at 4.45%, the highest compared with previous decades. Growth has increasingly been driven by allied sectors. Livestock recorded a compound annual growth rate of 12.77%

at current prices between 2015 and 2024, with gross value added rising by nearly 195%. Fisheries and aquaculture also expanded strongly, with fish production increasing by over 140% between 2014 and 2025. These segments have emerged as key contributors to farm incomes and rural employment diversification (https://www.msn.com/India/economic-survey-2026-navigating-indian-agriculture-growth-sustainability-challenges/.

Food grain production reached a record 362.96 mt in 2025-26, an increase of 25.43 mt over the previous year, led by higher output of rice, wheat, maize and coarse cereals. At the same time, the survey highlights the growing importance of horticulture, which now accounts for around 33%t of agricultural gross value added. Horticulture production rose from 280.70 mt in 2013–14 to 370.85 mt in 2025-26, with fruits, vegetables and other horticultural crops showing broad-based expansion. The survey reiterates the government's objective of doubling farmers' incomes through productivity enhancement and policy and institutional interventions. Key initiatives include expanded irrigation coverage, improved seed quality, soil health management, farm mechanisation, crop insurance and market access reforms. Gross irrigated area as a share of gross cropped area increased from 41.7% in 2001–02 to 55.8% in 2022–23, while over 25.55 crore Soil Health Cards have been issued to promote balanced nutrient use. Efforts to reduce import dependence have also gathered momentum. Domestic edible oil availability increased to 12.18 mt in 2023–24, reducing reliance on imported edible oil. A mission-mode push for self-sufficiency in pulses was approved in October 2025 to raise productivity and stabilise supplies. Crop insurance coverage expanded sharply, with 4.19 crore farmers insured in 2024–25, a 32% increase over 2023. Income support through direct transfers and higher minimum support prices continued to provide stability amid weather and market risks (https://www.msn.com/India/economic-survey-2026-navigating-indian-agriculture-growth-sustainability-challenges).

Enhancing Economic Resilience & Safeguarding Growth

Diversified Trade Architecture: India must reduce overdependence on select geographies by building a multi-aligned trade strategy that includes regional groupings, bilateral agreements, and south-south cooperation. Creating alternative supply corridors through friend-shoring and near-shoring can cushion supply chain shocks. Focus should be on critical sectors like energy, semiconductors, and rare earths to secure long-term interests. This requires institutionalized frameworks for strategic trade partnerships. Such diversification insulates the economy from sudden external volatility.

Financial System Shock Absorption: The financial sector must be fortified with macro-prudential regulations, counter-cyclical buffers, and stress-testing mechanisms to withstand external shocks. Promoting deeper domestic capital markets and reducing reliance on volatile foreign portfolio flows increases stability. Use of digital finance and fintech innovation can ensure continuity of services during disruptions. A calibrated currency management strategy shields against external turbulence. Such a framework ensures financial resilience even under uncertain global conditions.

Resilient Agricultural and Food Systems: Geo-economic disruptions often impact food supply chains; hence India needs a climate-smart, technology-driven, and diversified agri-base. Investments in post-harvest infrastructure, cold chains, and localised procurement systems can buffer supply shocks. Promoting crop diversification and resilient seeds enhances adaptive capacity. Strategic food reserves managed with transparency can act as shock absorbers. This ensures food security, price stability, and rural income resilience simultaneously.

Technological Sovereignty and Digital Resilience: Securing India's digital ecosystem and critical technologies is central to future resilience. Developing indigenous capacity in AI, 5G/6G and cybersecurity reduces external vulnerabilities. Building domestic digital infrastructure clouds safeguards sensitive data from geo-political disruptions. Encouraging R&D and innovation ecosystems fosters self-reliance while maintaining global competitiveness. Such technological sovereignty creates insulation against techno-economic fragmentation.

Human Capital and Labour Resilience: Resilience is also about people; skilling the workforce in future-ready domains ensures adaptability to disruptions. Portable social security systems protect migrant and gig workers from sudden economic downturns. Strengthening public health systems and workplace safety nets provides resilience against pandemics or climate-linked shocks. Labour codes should encourage flexible yet secure employment models. Such investments in human capital create a stable base for sustained growth.

Regional and Global Leadership Role: India should position itself as a rule-shaper in global economic governance. Proactive leadership in platforms like G20, BRICS, and Indo-Pacific frameworks allows India to shape rules of trade, finance, and technology to its advantage. Building regional financial safety nets and coordinated crisis responses adds layers of protection. Strategic diplomacy (recent India-China-Russia alignment) can convert vulnerabilities into geo-economic leverage. Such leadership builds not just resilience, but influence.

Internationalisation of the Rupee: A resilient economy requires reducing exposure to external currency shocks by

gradually internationalising the Rupee. Expanding bilateral and multilateral settlement agreements in Rupees, especially with energy and commodity partners (e.g., Rupee-Rubel Agreement), can cut dependence on the US dollar. Promotion of rupee-denominated trade invoicing, swap lines, and digital rupee linkages strengthens monetary sovereignty. Over time, a regional rupee zone can emerge, enhancing both stability and strategic autonomy.

Strengthening Domestic Demand Base: Enhancing domestic demand is vital to insulate India from external slowdowns and supply-chain shocks. A two-pronged strategy is needed. MSME growth by improving credit access, reducing compliance costs, and leveraging digital platforms; reinforcing public capital expenditure in infrastructure, housing, and green technologies to crowd-in private sector participation. Simultaneously, expanding domestic tourism, cultural industries can generate new internal multipliers. By combining inclusive consumption with investment-driven growth, India can create a resilient demand base that cushions against global economic turbulence.

Measures Needed to Strengthen India's Agriculture Sector

Universalizing Digital Public Infrastructure: The primary measure for modernization is the nationwide scaling of AgriStack to create a seamless digital ecosystem for every farmer. By integrating land records, crop surveys, and unique Farmer IDs, the government can enable "plug-and-play" access to formal credit, crop insurance, and customized advisory services. This digital backbone eliminates middlemen, reduces the credit-processing lag from weeks to minutes, and allows for precision-targeted benefit transfers that prevent leakage and ensure that aid reaches the actual tiller of the land.

Transitioning to Precision Agriculture via "Bharat-VISTAAR": A critical shift is needed from generic agricultural extension to AI-driven precision advisory through platforms like the newly proposed *Bharat-VISTAAR*. By leveraging real-time satellite imagery and multilingual AI, farmers can receive plot-specific recommendations on soil health, irrigation schedules, and localized pest alerts. This "Intelligence-as-a-Service" model helps smallholders optimize input use reducing the excessive application of urea and water thereby lowering production costs while simultaneously increasing yield quality and environmental sustainability.

Incentivizing "Market-Led" Crop Diversification: To break the ecologically damaging wheat-rice monoculture, India must implement a Productivity-linked Incentive (PLI) for high-value and climate-resilient crops like oilseeds, pulses, and plantation crops (coconut, cashew, cocoa). Instead of just announcing MSPs, the state should develop regional Specialized Crop Boards that provide end-to-end support, from high-quality germplasm to guaranteed procurement for processing industries. This shifts the focus from "volume-centric" farming to "value-centric" entrepreneurship, aligning domestic production with global demand and reducing the massive import bill for edible oils.

Decentralized Post-Harvest Infrastructure and "First-Mile" Connectivity: Strengthening the sector requires moving value-addition closer to the farm gate through Village-Level Processing Hubs funded by the Agriculture Infrastructure Fund (AIF). Measures should prioritize "first-mile" logistics, such as solar-powered micro-cold rooms, pack-houses, and grading units managed by Farmer Producer Organization (FPOs) or SHGs. By reducing the post-harvest wastage in horticulture, farmers can bypass distress sales during peak harvest and gain the "holding power" necessary to negotiate better prices in the national and global markets.

Mainstreaming Climate-Smart and Natural Farming Practices: With climate volatility becoming a permanent risk, India must institutionalize Sustainable Agricultural Practices (SAPs) like Zero Budget Natural Farming (ZBNF) and high-density orcharding. This involves establishing a decentralized network of Bio-Input Resource Centres at the panchayat level to provide organic fertilizers and pesticides, reducing the financial and ecological burden of chemical inputs. Such measures not only restore soil organic carbon and groundwater levels but also help Indian produce meet the increasingly stringent "green" standards of international export markets.

Professionalizing the Allied Sector: As allied sectors now grow faster than crop farming, they require Industrial-Scale Institutionalization through dedicated value chains and credit-linked subsidies. Measures should include the creation of "Livestock FPOs" and the integration of inland water bodies (like *Amrit Sarovars*) into the formal blue economy for intensive aquaculture. Providing universal access to high-quality semen banks, mobile veterinary clinics, and digital traceability for dairy and meat products will ensure that these "monsoon-proof" sectors become the primary drivers of rural income stability and export growth.

Reforming Agricultural Credit through "Risk-Guarantee" Frameworks: To unlock private investment, the financial architecture must evolve from simple interest subvention to Credit-Risk Guarantee Funds. By providing partial guarantees to banks, the state can encourage lending to "high-risk" areas like agri-startups, climate-tech, and small-scale mechanization (drones/robotics). This de-risking of the sector attracts venture capital and encourages young "Agri-preneurs" to modernize the value chain, transforming farming from a subsistence activity into a technologically sophisticated and bankable business enterprise.

Agricultural Development through Government Schemes

Given the sector's importance, the government has periodically launched several initiatives to modernize agriculture, improve farmer livelihoods, and address climate challenges. The recent approval of seven new schemes reflects a continuation of this effort, integrating cutting-edge technology and sustainability to adapt to modern challenges.

Digital Agriculture and Technological Integration: The role of digital agriculture has been growing globally, and India is no exception. The Digital Agriculture Mission (DAM) seeks to enhance productivity through precision agriculture, the use of data analytics, and blockchain for supply chain transparency. These technologies allow for the optimization of inputs such as water, seeds, and fertilizers, which leads to better yields while minimizing environmental impact. Furthermore, the creation of an Agri Stack—a platform that provides digital identities to farmers—demonstrates the government's effort to bring farmers into the formal economy, improving access to subsidies, credit, and insurance. International studies also show that digital platforms can transform agricultural practices. For example, in the U.S., the use of digital farm management systems has resulted in better resource utilization and higher incomes. These insights apply to India, where smallholder farmers can benefit significantly from technology-driven solutions, provided there is adequate infrastructure and digital literacy.

Climate-Resilient Agriculture: Climate change remains a significant threat to agricultural productivity, especially in developing countries like India. The integration of climate adaptation Technologies—such as drought-resistant seeds, real-time weather prediction, and solar-powered irrigation—helps mitigate the adverse effects of erratic climate patterns. In this context, the government's recent schemes emphasizing crop science for food and nutritional security are crucial. These initiatives align with global practices of investing in crop genetics and biotechnology to enhance resilience (FAO, 2021). Similar strategies have been adopted in countries like Singapore, where high-tech urban farming, controlled-environment agriculture, and climate-resilient crop varieties have been employed to address food security issues in the context of climate change. By adopting such technologies, India's farming sector could become more resilient, ensuring food security for its growing population.

Agricultural Education and Human Resource Development: The modernization of agricultural education under the New Education Policy 2020 aims to equip students and professionals with the skills required to tackle contemporary agricultural challenges (Basu and Sarkar, 2023). The government's recent focus on strengthening agricultural education and research is designed to integrate emerging technologies like artificial intelligence, big data, and remote sensing into the curriculum. Research suggests that the success of future agricultural innovations will rely heavily on human capital and the integration of interdisciplinary knowledge. Countries like the UK have successfully reformed their agricultural education systems to incorporate new technologies, leading to increased research outputs and innovation. India's emphasis on reforming its agricultural education system mirrors this global trend, ensuring that farmers and agribusiness professionals are well equipped to address future challenges.

Sustainable Livestock Health and Production: Livestock farming in India plays a significant role in rural economies, yet the sector faces challenges such as poor animal health services, low productivity, and climate vulnerability. The Sustainable Livestock Health and Production scheme focuses on improving animal health management, dairy production technologies, and genetic resource management, all crucial for enhancing productivity and income (Bhardwaj, 2023). The government's strategy aligns with global best practices. For instance, in Australia, livestock health management programs emphasize disease control and genetic improvements, leading to higher meat and dairy production (Brown and Watson, 2022). Similarly, the inclusion of precision livestock farming, which uses wearable sensors for real-time monitoring of livestock health, could lead to significant productivity gains in India, reducing input costs while improving animal welfare.

Horticulture and Income Diversification: The expansion of horticulture under the Sustainable Development of Horticulture scheme is a significant step toward diversifying farmer incomes. Horticultural crops like fruits, vegetables, and medicinal plants have high market value, making them a profitable alternative to traditional cereal crops. Research indicates that crop diversification not only improves income but also contributes to food and nutritional security. In a study on the economic impact of horticulture in India, it was noted that the promotion of diverse crops such as spices, medicinal plants, and floriculture could increase farmer profitability. Additionally, countries like Israel have demonstrated the efficacy of integrating technology with horticulture, particularly in regions with water scarcity. The application of drip irrigation and soil-less cultivation in India's horticultural initiatives can similarly boost output and efficiency.

Krishi Vigyan Kendras (KVKs) and Agricultural Extension Services: The role of *Krishi Vigyan Kendras* (KVKs) in providing location-specific technologies to farmers is critical for improving rural livelihoods (Chandra and Roy, 2023). KVKs function as the bridge between research institutions and farmers, ensuring the effective transfer of knowledge. A study by Deshmukh *et al*. (2023) on the impact of KVKs revealed that farmers with access to KVK services reported higher yields and improved adoption of sustainable farming practices.

Sustainable Livestock Health and Production: Recognizing the importance of the livestock sector in rural livelihoods, this scheme will enhance veterinary services, dairy technology, and animal health management. The program emphasizes small ruminant development, genetic resource management, and nutrition, all aimed at increasing farmer income through sustainable livestock practices.

Sustainable Development of Horticulture: The horticulture sector, known for its contribution to farmers' income diversification, is central to this scheme. The government plans to promote the cultivation of a wide range of crops, including tropical, temperate, and medicinal plants. By integrating new cultivation techniques and promoting value chains for horticultural crops, this scheme aims to improve productivity and income. *Krishi Vigyan Kendras* (KVKs) KVKs are the backbone of India's agricultural extension services. This scheme focuses on strengthening these institutions to provide location-specific solutions through research and demonstrations. KVKs are critical in ensuring that small farmers have access to the latest sustainable farming technologies and practices.

Natural Resource Management (NRM): With the increasing threat of natural resource depletion, this scheme emphasizes the sustainable use of soil, water, and other resources to ensure that current agricultural needs are met without compromising future productivity. The integration of climate-adaptive practices and the promotion of renewable energy technologies like solar-powered irrigation are key strategies under this program.

Detailed Analysis

Digital Agriculture in Global Context: Countries like the U.S. have successfully implemented digital platforms to boost farm productivity, especially through the use of sensors, drones, and precision farming techniques. India is following a similar trajectory, but it will need to overcome infrastructural challenges, particularly in rural areas with limited digital access.

Climate-Resilient Approaches: In Singapore, controlled-environment farming techniques have proven successful in dealing with unpredictable weather patterns. Adopting similar climate resilient technologies, such as high-tech greenhouses and climate-adapted crops, could be transformative for Indian agriculture, particularly in the context of erratic monsoon patterns.

Livestock Sector: Australia's livestock management strategies, particularly disease control and genetic improvement programs, provide a model for India's initiatives. Improving livestock productivity will be key for rural economic stability and could raise incomes substantially for farmers involved in dairy and meat production.

Horticulture: Israel's advanced horticulture practices, especially in water-scarce environments, serve as an important case study for India. Techniques like drip irrigation and hydroponics can help India increase horticultural productivity and income diversification, which is critical in regions with limited water availability.

Data and Expected Outcomes

The government has set a financial outlay of Rs 14,000 crore for these agricultural schemes. It is expected to drive higher farmer incomes, improve productivity, and enhance climate resilience, these schemes are vital for boosting India's agricultural GDP, which currently contributes around 18.2% to the total economy. Horticultural expansion and livestock health improvements are expected to directly benefit smallholder farmers, potentially reducing income disparities. Schemes like the *Pradhan Mantri Fasal Bima Yojana* (PMFBY) have already expanded crop insurance coverage, ensuring resilience against climate shocks.

Government's Modest Support for Agriculture

Modest allocations and limited structural reforms raise concerns over income volatility, climate stress, and long-term agricultural resilience. Around 59% of rural employment and about 40% of Gross Value Added (GVA) are directly attributable to agriculture. As noted by economist Mahendra Dev, the sector plays a crucial role in realising the vision of a "Viksit Bharat" The agriculture and allied sector has experienced moderate but fluctuating growth over the past four years. Looking ahead, agricultural growth is projected to slow to 3.1% in 2026, down from 4.5% in 2025, underscoring the need for targeted policy support and investment in the GoI's 2026–27 to stabilise productivity and safeguard rural incomes (https://telanganatoday.com/opinion-union-budget-2026-27-high-hopes-lean-support-for-agriculture).

Modest Attention: Despite agriculture being the backbone of India's economy, the sector continues to receive modest GoI's attention. Over the past three years, allocations have not increased significantly and have fluctuated without a clear long-term strategy in place. In 2023–24, agriculture was allocated Rs 1.267 lakh crore to strengthen farm incomes and rural infrastructure. This rose to Rs 1.414 lakh crore in 2024–25, with a focus on diversification, allied sectors, and digital initiatives, only to moderate to Rs. 1.334 lakh crore in 2025–26, targeting rural demand revival, income enhancement, and flagship schemes such as the *Dhan-Dhaanya Krishi Yojana* and high-yield seeds. In contrast, while these allocations offer some support, they fall short of the expectations set by the Union Budget 2026–27, as the relatively small and uneven increases fail to adequately address persistent income volatility, rising input costs, and continuing market uncertainties faced by farmers. The Budget 2026–27 outlines strategies to provide much-needed support to boost farmers' incomes, revive growth in agriculture and allied activities,

and enhance innovation and productivity. Total government expenditure increased by 7.7% between the 2025–26 (RE) and 2026–27 (BE), rising from Rs 49.65 lakh crore to Rs 53.47 lakh crore, with capital spending growing by over 11.5% to reinforce infrastructure-led growth. The government allocated Rs 1.63 lakh crore for agriculture and allied activities in 2026–27 budget, an increase of 7.12% over the revised estimate of Rs 1.52 lakh crore in 2025–26. Agricultural allocations increased by just 2.01% in the Budget Estimates for 2026–27, indicating limited priority despite rising sectoral challenges. Specifically, the allocation pertains to the Ministry of Agriculture and Farmers' Welfare, (MoA&FW) up by 5.37%, from Rs 1.33 lakh crore in 2025–26 (RE) to Rs 1.41 lakh crore in 2026–27 (BE) (https://telanganatoday.com/opinion-union-budget-2026-27-high-hopes-lean-support-for-agriculture).

Important Initiatives are as below: i) giving top priority to promoting commercial crops, including coconut, cashew, cocoa, sandalwood, and horticulture, particularly from the Northeast and hilly areas, which will benefit growers by increasing their income and productivity; ii) strengthening the fisheries supply chain and improving market linkages by involving women's groups and FPOs (Farmer Producer Organisations) to boost the productivity of coastal fisheries and farmers; iii) introducing a multilingual artificial intelligence tool called '*Bharat-VISTAAR*,' allocating Rs 150 crore to increase farmers' knowledge of agricultural practices; and iv) overall, the GoI has taken many initiatives in animal husbandry to boost domestic processing and exports of fisheries, and to foster entrepreneurship and generate quality employment in rural and peri-urban areas.

Shift in Strategy: The 2026–27 Budget signals a clear shift in the government's rural and agricultural strategy, moving away from broad-based income support and employment guarantees towards a slight improvement in productivity, market integration, and value-chain strengthening. While allocations for PM-Kisan and the Modified Interest Subvention Scheme remain unchanged, indicating continued income and credit support, the steep reduction in the MGNREGS allocation — from Rs 88,000 crore in 2025–26 (RE) to Rs 30,000 crore in 2026–27 (BE) — signals a shift away from wage-led rural support. This change appears driven by the introduction of the new VB-GRAM-G scheme and changes in Centre–State cost-sharing, under which States are expected to bear a larger share of expenditure. While MGNREGS fully covers wage costs at the central level, the proposed increase in guaranteed employment from 100 to 125 days raises concerns about fiscal sustainability and implementation capacity at the State level. Instead, higher allocations to schemes such as RKVY (*Rashtriya Krishi Vikas Yojana*), *Krishionnati Yojana*, and *PM Annadata Aay Sanrakshan Yojana* point to an emphasis on agricultural diversification, technological upgradation, price support mechanisms, and supply-side reforms. Increased spending on the *Krishionnati Yojana* and RKVY is likely to benefit farmers by improving extension services, enhancing productivity, and strengthening market linkages. At the same time, the marginal rise in the Agriculture Infrastructure Fund reflects continued focus on post-harvest infrastructure. However, the cut in FPO allocations raises concerns about the pace of farmer collectivisation. Overall, the Budget reflects a strategic reorientation from short-term rural relief to longer-term agricultural resilience and market-oriented growth, with mixed implications for immediate rural livelihoods.

Falling Short: A major concern is that the GoI has fallen short in adequately addressing the needs of the agricultural sector: i) First, the marginal increase in agricultural allocations is inadequate, and over the past three years, the sector has not been accorded priority; ii) Second, the continued emphasis on welfare measures and subsidies may offer short-term relief but does little to strengthen the rural economy in the long run; iii) Third, agricultural performance in 2025 has been weak, with farmers facing mounting challenges from climate change, groundwater stress, and declining soil quality; yet the Budget makes little attempt to address these long-term structural constraints that threaten productivity; and iv) Fourth, despite India exporting fresh fruits and vegetables to 123 countries and entering 17 new markets in recent years, the Central Budget 2026–27 misses an opportunity to build on this momentum. Higher allocations for quality upgradation and export-oriented infrastructure in the fruits and vegetables sector could have boosted farmer incomes while strengthening India's presence in global agri-markets.

Overall, the Union Budget 2026–27 tries to reduce dependence on traditional crop farming by encouraging diversified rural livelihoods and non-farm jobs. While higher spending on fisheries and animal husbandry is a positive step, the lack of major reforms in agriculture, especially in research, technology, and investment, remains a concern. More focused support for productivity, supply chain strengthening, and farmer skill improvementis urgently needed. Without strengthening the core of Indian agriculture, achieving the goal of Viksit Bharat will be difficult.

CONCLUSION

Recent agricultural schemes of the Indian government represent a critical step toward modernizing and transforming India's agriculture sector. By focusing on digitalization, climate resilience, sustainable livestock and horticulture development, and agricultural education, these initiatives address both immediate challenges and long-term sustainability. The successful implementation of these schemes could lead to improved agricultural productivity, increased farmer incomes, and enhanced food security in India. However, continuous monitoring and effective resource allocation are essential to realizing their full potential. The latest data on agricultural development in India, as highlighted in the 2023-24 Economic Survey, shows

the sector's steady growth, contributing around 18.2% to the country's GDP and supporting 42.3% of the population's livelihood. Over the last 5-6 years, the sector has grown at an average annual rate of 4.18%, with 2024-25 setting a record for food grain production at 362.96 mt. Despite challenges like delayed monsoons in 2023–24, production remains robust, with slightly lower food grain output at 328.8 mt. Additionally, the government has been focusing on enhancing climate resilience and sustainable agriculture through major schemes. For example, under the *Pradhan Mantri Fasal Bima Yojana* (PMFBY), the insured crop area has expanded from 500.2 lakh hectares in 2022–23 to 610 lakh hectares in 2023–24, making it the largest crop insurance scheme in the world by farmer enrolment. Significant investments have also been made in agricultural mechanization, with ₹859.45 crore allocated in 2023-24 to promote the use of modern machinery and Custom Hiring Centres (CHCs). Moreover, the Digital Agriculture Mission continues to drive innovation, with ₹450 crore allocated to support digitization in agriculture, while initiatives like the Agricultural Accelerator Fund aim to foster innovation among start-ups in rural India https://www.investindia.gov.in/sector/agriculture-allied-sector. These programs align with efforts to boost exports, which reached $19.69 billion in agricultural products during 2022–23. Together, these policies and schemes are aimed at promoting sustainable practices, enhancing farmer incomes, and improving India's food security

India's economy stands at a crossroads-strong in fundamentals yet vulnerable to global headwinds of trade wars, inflationary shocks, and supply chain disruptions. Building resilience now requires a holistic approach: diversifying trade, securing energy and food systems, empowering human capital, and deepening domestic demand. Strategic autonomy through rupee internationalisation and technological sovereignty will anchor India's long-term stability. “True economic strength lies not in escaping turbulence, but in learning to sail steadily through it.” India's agricultural future lies in value-chain deepening, digital intelligence, and diversification beyond water-intensive crops, not higher subsidies. AI-led advisories, first-mile infrastructure, and allied-sector growth can stabilize farm incomes against climate and price shocks. Achieving oilseed self-reliance, export-oriented processing, and groundwater sustainability demands a shift from price support to productivity-led reforms. A climate-smart, technology-driven, market-linked agriculture is vital for India's food security and rural resilience.

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