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Enhancing the socio-economic well-being of farmers in eastern India: A strategic approach

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Agriculture is the backbone of the economy in eastern India, supporting millions of farmers despite persistent structural and climatic challenges. This study explores a strategic approach to enhance the socio-economic well-being of farmers through agricultural intensification, improved market access, financial inclusion, and sustainable practices. The region, rich in natural resources, faces obstacles such as low mechanisation, inadequate irrigation, yield gaps, and climate vulnerabilities. By implementing a holistic strategy, integrating modern technology, policy reforms, rural infrastructure development, and enterprise diversification, this research presents a roadmap for transforming eastern India's agrarian landscape. Key recommendations include promoting high-yield and climate-resilient crop varieties, strengthening agri-logistics, expanding financial services, and fostering agri-tech innovations. These measures can drive inclusive growth, ensuring both economic prosperity and environmental sustainability for the region's farming communities.

Keywords: Economic prosperity, Policies, Structural reforms, Sustainability

THE eastern region of India, comprising Bihar, Chhattisgarh, eastern Uttar Pradesh, Jharkhand, Odisha, and West Bengal, is inhabited by about 34% of the country's total population while covering 21.85% of its geographical area. This region is blessed with rich natural resources and diverse agro-climatic conditions, offering unique opportunities for diverse farming practices, including crop production, livestock rearing, and aquaculture. Agriculture remains the primary livelihood source for millions of resource-constrained farming communities, contributing significantly to the regional economy. The region also accounts for around 26.86% (35.06 million ha) of India's agricultural land. It produces 27.14% (85.70 million tonnes) of the country's total food grain production (Agricultural Statistics at a Glance, 2022). Hence, agriculture serves as the backbone of the economy in eastern India, where 82% of the population resides in rural areas. Additionally, this region also houses a large livestock and poultry population, contributing around 17.2% of the nation's total milk production and 32.3% of its fish production. Despite these contributions, productivity levels in both livestock and aquaculture sectors remain suboptimal due to various constraints.

The agriculture sector in this region is still regarded as the mainstay of the economy since nearly half of the population depends on agriculture for their livelihood. The region is blessed with rich natural resources and is one of the most productive and potential zones for crop intensification and diversification. However, agriculture in this region is characterised by complexity, diversity, and vulnerability to climatic and infrastructural challenges. A significant proportion of farmland is rainfed, with limited access to irrigation infrastructure, modern technology, and institutional support. The region is highly susceptible to climatic risks, including prolonged droughts during critical crop growth periods, leading to yield instability. Conversely, excessive rainfall results in water congestion and recurrent flooding, particularly during the *kharif* season, further restricting agricultural productivity.

Despite substantial precipitation, groundwater utilisation remains minimal, leading to a continued reliance on monsoon rainfall for crop production. Similarly, while the region has a high livestock population density compared to the national average, milk productivity remains low due to inadequate feed resources, poor breed improvement programmes, and limited veterinary infrastructure. In the fisheries and aquaculture sector, productivity remains significantly lower than in many other Indian states, despite the availability of extensive water resources. The region has approximately 0.4 mha of waterlogged areas and 8.16 mha of ponds and tanks. However, aquaculture productivity remains low, particularly in waterlogged areas, with an average yield of around 3.0 t/ha/yr from ponds.

The major challenges include small and fragmented landholdings, soil acidity and sodicity, lack of mechanisation and power, lowest per capita income, ever-increasing human population and thereby highest population density per km^2, poor infrastructure facilities for storage, processing and marketing, poor water management, etc., and limited adoption of modern farming practices in the region. On an overall basis, while the region holds substantial potential for agricultural intensification and diversification, addressing these structural and climatic constraints is crucial for enhancing productivity and ensuring sustainable agricultural development. Addressing the challenges faced by the farming community in eastern India and enhancing their socio-economic well-being requires a comprehensive, multi-pronged strategy. This approach should focus on boosting agricultural productivity, improving market access, promoting financial inclusion, strengthening knowledge management, ensuring sustainability, enhancing institutional policy support, improving rural infrastructure, and promoting enterprise diversification.

Boosting agricultural productivity: Yield gaps and technology adoption

One of the most pressing issues in the region is the significant yield gap in staple crops like rice. The average rice productivity in eastern India (2.3–2.5 t/ha) remains well below the national average of 3.8 t/ha and significantly lower than Punjab's 6.5 t/ha (ICAR, 2023). Additionally, mechanisation rates in the region stand at 40–45%, compared to over 80% in north-western states (Department of Agriculture and Farmers Welfare, 2023). Improving productivity requires targeted interventions including:

- Adoption of high-yielding and stress-tolerant crop varieties.
- Precision agriculture and modern irrigation systems (drip and sprinkler irrigation).
- Integrated nutrient and pest management techniques.

***Short-term policies*:**

- Subsidised distribution of stress-resistant and high-yielding seeds.
- Training and extension services to promote modern techniques like precision farming and integrated pest management.
- Increased access to mechanisation under the Sub-Mission on Agricultural Mechanization (SMAM).
- Pilot mechanisation hubs in selected districts.

***Medium-term policies*:**

- Expansion of irrigation facilities and efficient water management (drip and sprinkler systems).
- Promotion of climate-smart agriculture through crop diversification.
- Strengthening farm cooperatives for better input access.

***Long-term policies*:**

- Large-scale soil health improvement programmes.
- Expansion of research on high-yield and climate-resilient varieties.
- Establishment of agri-tech innovation hubs to pilot AI-based (data-driven) advisory tools and IoT (internet-connected field sensors) for farming, contingent on the rural connectivity and digital literacy these districts do not yet widely have.

Improving market access and value chain development

Limited market access is another significant constraint in the region. Despite being a major producer of rice, vegetables, and pulses, only 17% of agricultural produce in eastern India is sold through government agencies, Agricultural Produce Market Committees (APMCs), and private channels compared to 65% in Maharashtra and Karnataka (NABARD, 2023). This forces many farmers into distress sales, reducing farm incomes. Key interventions include:

- Strengthening agri-logistics and post-harvest storage facilities.
- Promotion of Farmer Producer Organisations (FPOs) and cooperatives.
- Digital marketing platforms and e-NAM (National Agriculture Market) integration.
- Pradhan Mantri Kisan Sampada Yojana (PMKSY) supports agro-processing clusters and cold storage chains.

These measures can reduce post-harvest losses, which currently account for 10–15% of perishable crops.

Table 1. Policies to improve market access and value chain development

Policies	Interventions
Short-term	• Strengthening e-NAM participation for better price realisation. • Providing cold storage and warehouse access at subsidised rates. • Encouraging the formation of FPOs.
Medium-term	• Development of agro-processing zones to promote value addition. • Investment in road connectivity and market infrastructure. • Implementing transparent pricing mechanisms in mandis.
Long-term	• Strengthening of contract farming models to ensure stable pricing and income security. • Expansion of agri-logistics through Public-Private Partnerships (PPP). • Establishing agricultural export hubs.

Promoting financial inclusion and credit access

Financial constraints further compound the challenges faced by farmers. Currently, only 40–50% of smallholder farmers in the region have access to institutional credit, leading many to rely on high-interest informal loans, with interest rates ranging from 28–36% annually (RBI, 2023). This financial exclusion is particularly severe in Bihar, Jharkhand, and West Bengal, where 35% of farmers still depend on informal credit sources (NABARD, 2023). Interventions include:

- Expansion of access to Kisan Credit Cards (KCC) and microfinance services.

- Subsidised crop insurance under PMFBY (Pradhan Mantri Fasal Bima Yojana).
- Direct Benefit Transfer (DBT) schemes for fertiliser and input subsidies can significantly improve financial security and enable farmers to invest in better farming practices.

Table 2. Policies to promote financial inclusion and credit access

Policies	Interventions
Short-term	• Enhancing awareness about Kisan Credit Cards and microfinance services. • Expanding coverage under PMFBY.
Medium-term	• Digitisation of rural banking to ensure seamless loan disbursement. • Introduction of low-interest credit schemes.
Long-term	• Strengthening rural financial institutions to provide easy access to long-term loans. • Piloting blockchain (a shared, tamper-resistant digital ledger) for transparent credit transactions, once digital banking infrastructure extends further into the region.

Strengthening knowledge management

The adoption of modern farming techniques remains low, with only 35% of farmers utilising agricultural extension services (ICAR, 2022). Interventions include:

- Expanding agri-tech platforms for digital advisory services
- Strengthening training programmes through Krishi Vigyan Kendras (KVKs), ATMAs and other extension agencies
- Fostering public-private partnerships in agricultural education can bridge knowledge gaps and improve farm efficiency, especially in the context of climate-resilient practices.

Ensuring sustainability

Climate change poses a major threat to agricultural productivity in eastern India. The region has witnessed a 15–20% decline in monsoon rainfall over the past two decades, leading to increased crop failures and water scarcity (India Meteorological Department, 2023). Rising temperatures are projected to reduce wheat yields by 8–10% by 2050 (ICAR, 2023). Further, over 40% of agricultural land in eastern India is prone to soil erosion and declining fertility. Key strategies for sustainability include:

- Promotion of climate-resilient crop varieties and drought-resistant seeds.
- Watershed development and rainwater harvesting.
- Organic and regenerative farming practices.

Table 3. Policies to strengthen knowledge management

Policies	Interventions
Short-term	• Organising farmer field schools and extension programmes through KVKs. • Expanding mobile-based advisory services for real-time farming guidance.
Medium-term	• Development of agri-tech startups offering precision farming solutions. • Strengthening PPP for agricultural education.
Long-term	• Establishing specialised agricultural universities focused on regional crops and techniques. • Integration of AI-based farming advisories at the national level.

Table 4. Policies to ensuring sustainability

Policies	Interventions
Short-term	• Distribution of drought-resistant seed varieties. • Encouragement of zero-tillage and crop rotation techniques.
Medium-term	• Large-scale watershed management projects. • Incentivising farmers for adopting organic and regenerative farming practices.
Long-term	• Expansion of afforestation and soil conservation programmes. • Strengthening climate-resilient agricultural policies. • Ensure 100% irrigation coverage through PM Krishi Sinchai Yojana (PMKSY).

Strengthening institutional policy support

Only 6% of farmers in eastern India participate in contract farming agreements, compared to 15–18% in southern India (Ministry of Agriculture and Farmers Welfare, 2023). Over 23% of farmland in Eastern India is cultivated by tenant farmers, but only 7% have formal leasing rights, making them ineligible for government schemes (NITI Aayog, 2023). Effective policy interventions are crucial to improve agricultural outcomes in Eastern India. Key areas of policy focus should include:

- Expanding Minimum Support Price (MSP) coverage for non-cereal crops.
- Strengthening contract farming frameworks for better farmer-buyer linkages.
- Providing incentives for mechanisation and farm technology adoption.
- Streamlining land leasing laws to facilitate smallholder participation.

The National Mission on Sustainable Agriculture (NMSA) and Agriculture Infrastructure Fund (AIF) can play a crucial role in supporting these initiatives (MoA&FW, 2023).

Table 5. Policies to strengthen institutional policy support

Policies	Interventions
Short-term	• Simplification of lease agreements for tenant farmers. • Introduction of policies to enhance MSP coverage.
Medium-term	• Reforming contract farming regulations to promote fair agreements. • Strengthening insurance coverage for non-cereal crops.
Long-term	• Implementing land digitisation initiatives for transparent land ownership records. • Establishing independent farmer welfare regulatory bodies.

Infrastructure development

Poor rural infrastructure is a significant bottleneck for agricultural growth. Investments in roads, irrigation, storage, and

rural electrification can improve productivity and market access. Currently, only 47% of the net sown area in eastern India is irrigated, compared to over 80% in Punjab and Haryana (Central Water Commission, 2023). Key focus areas include:

- Expansion of rural road networks for better farm-to-market connectivity.
- Investment in rural cold storage and warehousing facilities.
- Scaling up solar-powered irrigation and decentralised energy solutions.

Diversification of enterprises

Reducing dependency on traditional farming and promoting diverse income sources can enhance farmers' economic stability. Enterprise diversification presents a crucial pathway for economic stability in the region. Key areas of enterprise diversification include:

***Livestock sector potential*:** Eastern India contributes only 15% to India's total milk production, while states like Gujarat and Rajasthan contribute over 30% (NDDB, 2023). Poultry farming provides an additional ₹8,500 per capita annual income for marginal farmers (ICAR, 2023).

***Fisheries as a growth driver*:** Over 2.5 mha of water bodies remain underutilised for aquaculture (MPEDA, 2023). Despite vast water resources, eastern India contributes only 12% to India's total fisheries output.

Complementary policies for enterprise diversification follow the same three horizons: in the near term, promoting backyard poultry and integrated fish farming; in the medium term, developing milk-processing units, dairy cooperatives, and commercial aquaculture; and over the long term, building export markets for fishery and dairy products, modern livestock-management systems, and a dedicated Eastern India Agri-Export Zone.

Agro-processing and value addition for higher incomes

Agro-processing plays a crucial role in increasing farmers' incomes by reducing post-harvest losses, creating employment, and enhancing the value of raw agricultural produce. In India, agro-processing contributes nearly 12% of the GDP from manufacturing and employs around 13 million people (Ministry of Food Processing Industries, 2023).

***Potential for agro-processing in eastern India*:** Despite being a major agricultural hub, only 10–12% of agricultural produce in eastern India undergoes value addition, compared to 25–30% in states like Maharashtra and Gujarat (NABARD, 2023). The lack of processing facilities results in measurable post-harvest losses across commodities. The most recent national assessment (NABCONS, 2022, commissioned by the Ministry of Food Processing Industries) puts these losses appreciably lower than the 2015 ICAR-CIPHET baseline, reflecting recent cold-chain and storage investment, though fruits and vegetables remain the most exposed.

Table 6. Commodity-wise post-harvest losses in India (NABCONS, 2023)

Commodity	Post-harvest loss (%)
Cereals	3.9–5.9
Pulses	5.7–6.7
Oilseeds	2.9–7.5
Fruits	6.0–15.1
Vegetables	4.9–11.6
Milk	0.9
Marine fisheries	8.8
Inland fisheries	4.9

Expanding agro-processing industries such as rice milling, oilseed processing, dairy processing, and fruit pulp extraction can significantly improve rural incomes. The Pradhan Mantri Formalization of Micro Food Processing Enterprises (PMFME) Scheme, launched in 2020, aims to enhance small-scale agro-processing and has supported over 50,000 enterprises, particularly in states like Bihar, Odisha, and West Bengal.

Farm tourism and rural entrepreneurship initiatives

The Operation Greens scheme, which is focused on value addition for perishables, has expanded the processing capacity for crops like onions, tomatoes, and potatoes. However, there is a need to increase investment in cold storage, food parks, and rural processing units to further boost the sector.

Table 7. Policies to strengthen agro-processing units

Policies	Interventions
Short-term	• Promoting small-scale food processing units. • Encouraging community-level primary processing units.
Medium-term	• Establishment of agri-processing parks under PMKSY. • Strengthening processing linkages with global food markets.
Long-term	• Large-scale industrialisation of agro-processing sectors. • Developing blockchain-based (digitally verified) farm-to-fork traceability, building on the digital marketing and e-NAM platforms.

Farm tourism and rural entrepreneurship are emerging as promising alternatives for income diversification. With rural tourism growing at 15% annually, India's farm tourism market is expected to reach ₹3,000 crores by 2025 (Ministry of Tourism, 2025).

***Farm tourism in eastern India*:** The eastern region, with its rich agricultural landscapes, forests, and cultural heritage, has high potential for farm tourism. West Bengal has promoted 'Eco-Rural Tourism' in Sundarbans and Darjeeling tea estates, attracting 5 lakh tourists annually. Madhubani district, Bihar has developed agritourism circuits focused on organic farming, with farmers earning ₹1,500–2,500/tourist visit. Tribal farm tourism initiatives in Koraput, Odisha attract more than 10,000 visitors annually, generating over ₹5 crore in revenue.

***Rural entrepreneurship for economic growth*:** Rural entrepreneurship in agro-based industries has created thousands of jobs in eastern India. Key success stories include:

- Under the Rashtriya Gokul

Mission, small-scale dairy units have seen an income rise of 60% due to better milk marketing in Jharkhand and Bihar.

- Government support for rural clusters (West Bengal and Odisha) such as Baluchari silk weaving has increased artisan incomes by 40% in five years.
- The Makhana value chain in Mithila region, Bihar generates ₹500 crore annually, supporting 2 lakh farmers and entrepreneurs.

Table 8. Policies to strengthen farm tourism and rural entrepreneurship

Policies	Interventions
Short-term	• Promoting ecotourism in rural areas. • Encouraging farm-based experiential tourism.
Medium-term	• Establishing agri-tourism circuits. • Training programmes for rural entrepreneurs.
Long-term	• Integration of rural tourism with the national tourism network. • Development of smart villages with integrated tourism hubs.

Gender-responsive and indigenous knowledge-based approaches

Women perform most farm labour in the Eastern Gangetic Plains, 85% of post-harvest work, 82% of sowing and transplanting, and 72% of livestock care in northern Bihar, yet only 14% hold independent land titles and just 18% access institutional credit, against 72% of men. Male out-migration has intensified "feminisation of agriculture," raising women's workload without a matching gain in decision-making authority.

Women's Advancement in Rural Development and Agriculture (WARDA), Bihar piloted in two Bihar districts and later scaled to sixteen organised women smallholders into producer groups linked to maize, litchi, and vegetable value chains through Bihar's JEEViKA livelihoods mission. Maize procurement grew from 1,014 to 3,064 tonnes between 2015 and 2016, with farmers earning a patronage bonus of ₹50–60/q and receiving payment within 5–7 days through direct bank transfer, gains attributed to transparent digital weighing and direct market linkage. An independent process evaluation found the model effective at reviving defunct producer companies, but noted that women's control over the resulting income and over cropping decisions remained limited, a reminder that market access alone does not guarantee empowerment.

Practices developed by tribal and hill communities offer low-cost, climate-resilient complements to the technology-led interventions above. In Odisha's Eastern Ghats, stone bunding with broom grass has raised soil- and water-conservation efficiency by 34 and 59%, respectively; the traditional Jhola land cultivation method has lifted paddy yields by 22% by cutting runoff and soil loss, and strip-cropping finger millet with groundnut has cut runoff by 24% and soil loss by 66% compared with sole cropping. Blending such community-tested methods with the mechanisation, irrigation, and soil-health programmes proposed can extend their reach into rainfed and tribal tracts where capital-intensive interventions are hardest to sustain.

SUMMARY

A holistic approach that integrates technology, policy reforms, rural infrastructure development, and diversification of enterprises is crucial for the upliftment of eastern India's farming community. Strengthening agriculture, finance, and market linkages through data-driven interventions can drive inclusive growth, ensuring both economic prosperity and environmental sustainability for the region. Priority interventions include closing the rice yield gap through targeted mechanisation and irrigation in the lowest-productivity districts would lift output without requiring new land. Second, strengthening FPO-led market access would let farmers capture more of the value they already produce, directly addressing the challenge of lower market access that leaves most farmers exposed to distress sales. Sequencing effort behind these two would generate the earliest, most broadly distributed gains while the remaining interventions are phased in.

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National Pest Surveillance System

Launched on 15th August 2024 to enhance the surveillance and management of pest diseases across the country. The system utilises latest digital technologies such as Artificial Intelligence and Machine Learning (AI and ML) to provide quick and instant solution regarding pest attacks, crop diseases, crop damages, etc. by issuing real time crop protection advisory to the farmers. It includes a user-friendly mobile app and a portal for identification of pests and disease mitigation through integrated pest management.

NPSS