International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Enhancing the Efficiency and Sustainability of Rice Supply Chains in India: A Comprehensive Review

Bhavesh Bagul[1], Harshwardhan Garde[2], Atharva Otari[3], Sonal Patil[4]

[1,2,3]Research Scholar, Institute of Management Development and Research, Pune
[4]Corresponding author and guide, Institute of Management Development and Research, Pune

Abstract
India stands as a global leader in rice production and export, contributing significantly to both domestic food security and international markets. Despite this prominence, the Indian rice supply chain grapples with multifaceted challenges, including infrastructural inadequacies, post-harvest losses, market inefficiencies, labor issues, and environmental concerns. This review delves into the structural and operational aspects of India's rice supply chain, identifying critical bottlenecks and exploring innovative solutions to enhance efficiency and sustainability. Emphasis is placed on technological interventions, policy reforms, and sustainable practices that can fortify the supply chain against current and future challenges.

Keywords: Rice Supply Chain, Sustainability, Post-Harvest Losses

1. INTRODUCTION

Rice plays a pivotal role in India's agrarian economy, rural livelihoods, and national food security. As the second-largest producer of rice globally, after China, India cultivates this staple crop on approximately 43.39 million hectares of land, contributing an estimated 137.82 million tonnes of rice during the 2023–24 agricultural season [1]. The crop not only serves as a dietary staple for a large segment of India's population but also functions as a key commodity in international trade. India has maintained its position as the world's leading exporter of both basmati and non-basmati rice varieties, generating significant foreign exchange revenue and bolstering its agricultural trade profile.

The economic importance of rice extends beyond production and trade—it underpins the livelihoods of millions of smallholder farmers across the country, many of whom rely on rice cultivation as their primary source of income. Government policies such as the Minimum Support Price (MSP) and public procurement under the Public Distribution System (PDS) further emphasize rice's role in food policy and rural welfare.

However, despite these achievements, India's rice supply chain remains fraught with systemic inefficiencies and sustainability challenges. Post-harvest losses, poor storage infrastructure, fragmented market linkages, and outdated cultivation practices continue to constrain productivity and profitability. Environmental concerns, particularly related to excessive water usage, methane emissions, and land degradation, raise critical questions about the long-term sustainability of current rice production systems. Moreover, these challenges disproportionately impact smallholder farmers, who often lack access to

modern technologies, credit facilities, and stable market prices. As a result, India's rice sector must undergo structural reforms and technological modernization to enhance its efficiency, resilience, and ability to meet growing global food demands.

2. Structure of the Indian Rice Supply Chain

The Indian rice supply chain is a complex, multi-tiered system comprising various interdependent stages: input procurement, cultivation, post-harvest handling, processing, storage, marketing, and final distribution. Each of these stages plays a critical role in determining the quality, price stability, and availability of rice to consumers. A breakdown in any component can lead to losses, inefficiencies, or inequities across the entire value chain. Additionally, disparities in regional infrastructure, technological adoption, and market access further contribute to the heterogeneity of outcomes across India's rice-growing regions.

2.1. Production

Rice production in India is predominantly carried out by small and marginal farmers, who constitute more than 86% of the country's farming population [2]. These farmers typically operate on landholdings of less than 2 hectares and often lack access to critical resources such as assured irrigation, high-quality seeds, advanced machinery, and institutional credit. Consequently, rice cultivation is heavily dependent on monsoon rains, making it vulnerable to climate variability and droughts. Traditional farming practices are still widespread, particularly in eastern and central India, where the adoption of improved agronomic techniques, climate-resilient crop varieties, and System of Rice Intensification (SRI) methods remains low. Although government agencies and research institutions have promoted the use of high-yielding and stress-tolerant rice varieties, uptake has been uneven due to socioeconomic and informational barriers.

2.2. Post-Harvest Handling

Post-harvest handling in India remains one of the weakest links in the rice supply chain. The country experiences significant post-harvest losses, estimated between 10% and 15%, which translates into millions of tonnes of wasted grain annually [3]. These losses are primarily attributed to rudimentary drying techniques, poor handling practices, and insufficient rural infrastructure. Traditional methods such as open-air sun-drying on roadsides and village courtyards not only expose grains to dust, animals, and moisture but also increase the risk of fungal contamination. Inadequate availability of mechanical dryers, scientific storage facilities, and reliable transportation exacerbates these challenges. In many cases, harvested paddy is stored in jute bags in poorly ventilated godowns, leading to grain spoilage from pests, rodents, and mold growth.

2.3. Milling and Processing

India has an extensive network of more than 90,000 rice mills, ranging from modern integrated units to small, family-run traditional mills [4]. While modern mills with automated systems are capable of producing export-quality rice with high recovery rates, a majority of the small and medium enterprises still operate with outdated equipment. These inefficient milling processes result in high breakage rates, reduced head rice yield, and lower-quality output, which ultimately diminishes the commercial value of the product. Additionally, inadequate grading, polishing, and packaging standards among local mills restrict access to premium domestic and international markets. The lack of regulatory enforcement and limited investment in upgrading processing technologies continue to be barriers to improvement.

2.4. Marketing and Distribution

Marketing and distribution of rice in India are highly fragmented and often skewed in favor of intermediaries. Most smallholder farmers lack direct access to organized markets or value-added supply chains and

are therefore compelled to sell their produce to local traders or commission agents immediately after harvest, often at below-MSP prices. While the government operates a Minimum Support Price (MSP) procurement mechanism, its reach is limited to certain surplus-producing states like Punjab, Haryana, Chhattisgarh, and Telangana [5]. In other regions, especially eastern India, the absence of efficient procurement systems leads to distress sales and market exploitation. Moreover, the lack of adequate warehousing facilities and cold chain infrastructure further undermines farmers' bargaining power, preventing them from holding stocks until favorable market conditions arise. Public distribution through the Food Corporation of India (FCI) ensures food access to the poor, but inefficiencies in logistics and leakages remain persistent concerns.

3. Challenges in the Indian Rice Supply Chain

Despite India's prominent position as a leading global producer and exporter of rice, the sector faces a range of structural, logistical, environmental, and ethical challenges that undermine efficiency, equity, and sustainability. These challenges affect all stages of the rice value chain, from farm-level production to final distribution. Addressing them is essential to improve farmer livelihoods, reduce losses, and enhance food security.

3.1. Fragmented Landholdings

One of the fundamental structural issues in Indian agriculture is the extreme fragmentation of landholdings. Over 86% of Indian farmers are small and marginal, operating on less than two hectares of land [2]. This fragmentation inhibits economies of scale, making it economically unfeasible for farmers to invest in modern machinery, irrigation systems, or precision agriculture technologies. Small plots also create logistical challenges in input delivery, extension services, and coordinated harvesting. Furthermore, varying agronomic practices across neighboring plots often result in inconsistent grain quality, which complicates aggregation, grading, and marketing at scale. The inability to consolidate land or adopt cooperative farming models continues to constrain productivity and competitiveness.

3.2. Inadequate Storage and Post-Harvest Infrastructure

Post-harvest infrastructure in India remains woefully inadequate, especially at the farm and village levels. Most rural areas lack access to scientific storage solutions such as hermetic silos, cold chains, or controlled-atmosphere warehouses. Instead, harvested paddy is often stored in traditional warehouses, which are typically unhygienic, poorly ventilated, and susceptible to high humidity, rodent infestation, and fungal growth [6]. These substandard conditions lead to both quantitative losses (in terms of weight) and qualitative deterioration (in terms of nutrition, appearance, and taste), significantly impacting the market value of rice. Moreover, the lack of mechanical dryers, sorting equipment, and grading infrastructure prevents farmers from meeting the quality standards required for high-end domestic or export markets.

3.3. Dependence on Middlemen

The majority of smallholder farmers in India sell their produce through informal channels dominated by local traders and commission agents. This reliance on intermediaries stems from limited market access, lack of storage options, and the absence of real-time market intelligence. As a result, farmers are often compelled to engage in distress sales immediately after harvest, accepting prices below the government-declared Minimum Support Price (MSP). This dependency reduces farmers' profit margins and perpetuates cycles of indebtedness and poverty. Furthermore, the lack of farmer producer organizations (FPOs), cooperative marketing models, and digital trading platforms limits farmers' bargaining power and access to broader markets, including e-commerce and institutional procurement.

3.4. Climate Change and Environmental Issues

Rice is among the most water-intensive crops, requiring approximately 2,500–3,000 liters of water to produce one kilogram of paddy. In the context of India's growing water stress, exacerbated by over-extraction of groundwater and erratic monsoon patterns, the sustainability of conventional paddy cultivation is increasingly in question [7]. Climate change has further intensified these challenges, with increasing frequency of floods, droughts, and temperature extremes affecting crop yields and quality. In states like Punjab and Haryana, where rice is grown extensively using flood irrigation, the depletion of groundwater aquifers has reached critical levels. Additionally, methane emissions from continuously flooded rice paddies contribute significantly to greenhouse gas emissions, making rice cultivation a contributor to climate change as well. Without the widespread adoption of water-saving practices like Alternate Wetting and Drying (AWD) or aerobic rice systems, the ecological footprint of rice cultivation will remain high.

3.5. Labor and Ethical Issues

Manual labor continues to dominate harvesting, threshing, drying, and packaging activities across much of India's rice-producing belt. The labor-intensive nature of rice farming not only drives up costs but also creates vulnerabilities to labor shortages during peak seasons. Furthermore, there are documented instances of exploitative labor practices, including the use of child labor and bonded labor in certain regions [8]. Migrant workers, especially during post-harvest operations, are sometimes employed under informal and unregulated conditions, with inadequate wages and unsafe working environments. These practices raise serious ethical and human rights concerns and pose reputational risks to Indian rice exports, particularly in markets that demand strict adherence to labor standards and ethical sourcing.

4. Technological Interventions

In response to the structural inefficiencies and sustainability concerns within India's rice supply chain, a range of technological innovations are being explored and implemented. These technologies aim to improve transparency, efficiency, market access, and post-harvest management. By integrating digital tools and smart systems into the supply chain, stakeholders can reduce losses, enhance profitability, and align with international standards for quality and traceability.

4.1. Blockchain for Transparency

Blockchain technology has emerged as a transformative tool for enhancing transparency and trust in agri-food supply chains. In the context of rice, blockchain systems can record each stage of the supply chain—from seed sourcing and cultivation to harvesting, storage, milling, and final sale—in a decentralized, tamper-proof digital ledger [9]. This end-to-end traceability is particularly beneficial for exports, where compliance with international food safety, pesticide residue, and labor standards is critical. By enabling verifiable data sharing among farmers, processors, exporters, and regulators, blockchain can reduce fraud, eliminate redundant paperwork, and enhance consumer confidence. For example, a rice exporter using blockchain can offer buyers real-time verification of the origin, storage conditions, and certifications of a rice consignment, thereby improving brand reputation and market access.

4.2. IoT and Smart Storage Solutions

Internet of Things (IoT) technologies are being increasingly deployed to address inefficiencies in storage and logistics, which are key contributors to post-harvest losses. Smart sensors can continuously monitor environmental conditions such as temperature, humidity, gas composition, and pest activity within storage facilities and during transportation. Alerts generated by these sensors allow timely interventions, such as temperature adjustments or fumigation, preventing spoilage and contamination. Advanced storage

solutions, including climate-controlled silos and automated aeration systems, when integrated with IoT devices, help maintain optimal grain quality and extend shelf life. These technologies are especially useful in large-scale warehouses operated by cooperatives, Food Corporation of India (FCI), or private millers.

4.3. Mobile Applications and Digital Marketplaces

Mobile and web-based platforms have revolutionized information dissemination and market access for Indian farmers. Applications such as eNAM (National Agriculture Market) provide a unified online trading platform for agricultural commodities, enabling transparent price discovery and competitive bidding by buyers across India. Kisan Suvidha, launched by the Government of India, offers real-time updates on weather conditions, input prices, crop advisories, and pest alerts, empowering farmers to make informed decisions. Platforms like AgriBazaar and DeHaat go a step further by integrating services such as crop diagnostics, doorstep delivery of inputs, access to credit, and direct linkages to buyers. These digital ecosystems reduce the reliance on middlemen, increase income visibility, and facilitate better price realization for rice farmers. Furthermore, the proliferation of smartphones and mobile internet in rural India has accelerated the adoption of these solutions.

5. Government Policies and Institutional Mechanisms

The Indian government plays a pivotal role in shaping the rice supply chain through a combination of pricing policies, food security programs, and infrastructure development schemes. These interventions are designed to protect farmer incomes, ensure food availability for vulnerable populations, and enhance the overall efficiency and competitiveness of the agricultural sector. However, policy implementation often faces challenges related to regional disparity, administrative inefficiency, and uneven infrastructure development.

5.1. Minimum Support Price (MSP)

The Minimum Support Price (MSP) system is one of the most significant policy tools employed by the Indian government to ensure remunerative prices for farmers. For the 2023–24 Kharif season, the MSP for common paddy was fixed at ₹2,183 per quintal [5]. While MSP acts as a price safety net, especially in years of market downturn or surplus production, the actual effectiveness of this mechanism is limited by regional disparities in procurement operations. States like Punjab, Haryana, Chhattisgarh, and Telangana, with established procurement infrastructure and political support, account for a disproportionate share of government purchases. In contrast, rice-producing states such as West Bengal, Bihar, Assam, and Odisha—despite having a large number of smallholder farmers—experience minimal MSP procurement due to logistical bottlenecks and lack of awareness. This skewed implementation perpetuates income inequality and undermines the broader goal of inclusive agricultural growth.

5.2. Public Distribution System (PDS)

The Public Distribution System (PDS) is a cornerstone of India's food security strategy, supplying subsidized rice and other food grains to over 800 million people under the National Food Security Act (NFSA). PDS stabilizes demand for rice and ensures a consistent outlet for government-procured paddy, thereby influencing the functioning of the broader rice economy. However, the system continues to grapple with structural inefficiencies, including leakage, diversion, and the inclusion of ineligible beneficiaries. Although significant strides have been made toward digitization—such as the introduction of Aadhaar-linked ration cards and electronic point-of-sale (ePoS) devices—these reforms have not been uniformly adopted across states. Some regions still lack end-to-end computerization, making it difficult to monitor stock movements and verify entitlements accurately. Moreover, the centralised nature of procurement and

distribution often leads to mismatches between regional production and consumption patterns, resulting in transport inefficiencies and wastage.

5.3. Infrastructure Development Initiatives

Recognizing the critical gaps in agri-logistics and post-harvest infrastructure, the Indian government has introduced several schemes aimed at promoting private investment and public-private partnerships in the agriculture sector. The **PM Kisan Sampada Yojana** (Pradhan Mantri Kisan Sampada Yojana) focuses on modernizing food processing, developing cold chain networks, and reducing wastage by providing financial incentives for infrastructure creation. Similarly, the **Agriculture Infrastructure Fund (AIF)** offers medium- to long-term debt financing at subsidized interest rates for building warehousing, primary processing units, and value-added services like grading and packaging. These schemes have the potential to transform rural supply chains by enhancing storage capacity, minimizing post-harvest losses, and improving farmer access to markets. However, on-the-ground implementation remains inconsistent. Delays in project approvals, lack of awareness among eligible stakeholders, and bureaucratic hurdles in credit disbursement have limited their impact, particularly in underserved and remote areas.

6. Sustainable Practices in Rice Supply Chains

Sustainability has become a critical concern for rice supply chains globally, particularly in a country like India, where rice cultivation is resource-intensive and heavily dependent on water, energy, and agrochemicals. To address the environmental, economic, and social dimensions of sustainability, multiple eco-friendly practices are being promoted through government policies, research initiatives, and grassroots innovations. These practices aim to enhance resource use efficiency, reduce environmental footprints, and improve resilience to climate change—while maintaining or increasing productivity.

6.1. System of Rice Intensification (SRI)

The System of Rice Intensification (SRI) is an agroecological methodology aimed at increasing the productivity of rice by altering traditional crop management techniques. Key components of SRI include the use of younger seedlings, wider spacing between plants, intermittent irrigation instead of continuous flooding, and the use of organic manure over chemical fertilizers. SRI methods enhance root growth and soil microbial activity, leading to healthier plants and improved yields. Empirical studies from states like Tamil Nadu, Andhra Pradesh, and Bihar report yield increases of 20%–50% along with significant reductions in input costs—particularly water, seed, and chemical fertilizers [7]. Additionally, SRI promotes water conservation by reducing irrigation requirements by up to 40%, making it highly suitable for water-scarce regions. Despite its demonstrated benefits, widespread adoption remains constrained by knowledge gaps, labor requirements, and the need for behavior change among farmers accustomed to conventional methods.

6.2. Alternate Wetting and Drying (AWD)

Alternate Wetting and Drying (AWD) is a water-saving irrigation technique developed and promoted by the International Rice Research Institute (IRRI). Unlike traditional practices that keep paddy fields continuously flooded, AWD involves periodic drying of the field until hairline soil cracks appear before re-irrigating. This not only conserves water but also reduces methane emissions—a potent greenhouse gas generated under anaerobic conditions in flooded fields. Field trials conducted in Tamil Nadu, Odisha, and Eastern Uttar Pradesh have shown that AWD can reduce irrigation water usage by 20%–30% and lower methane emissions by more than 30%, with no negative impact on yield [10]. The technique also improves root oxygenation, enhancing plant health and resilience. However, the success of AWD depends on careful

field-level monitoring and access to controlled irrigation infrastructure, which remains a constraint in many areas relying on erratic canal systems or monsoon rainfall.

6.3. Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is a holistic approach to crop protection that combines biological, cultural, physical, and chemical tools to manage pests in an ecologically and economically sound manner. In rice cultivation, IPM practices include promoting beneficial insect populations (e.g., spiders, dragonflies), using pest-resistant rice varieties, implementing crop rotation, and applying pesticides only as a last resort and in targeted doses. By minimizing indiscriminate pesticide usage, IPM reduces production costs, prevents pesticide resistance, and protects non-target organisms, including pollinators and aquatic life. In India, several government programs and NGOs have supported the training of farmers in IPM through Farmer Field Schools and village-level demonstration projects. Adoption of IPM not only improves environmental outcomes but also enhances the safety of rice for domestic consumption and export, particularly in light of increasing scrutiny over pesticide residues in global markets.

7. Case Studies and Success Stories

Highlighting successful models within India's rice supply chain can offer valuable lessons for replication and scaling across other regions. These case studies demonstrate how targeted interventions, community engagement, and supportive policies can overcome structural challenges and deliver significant economic, environmental, and social benefits.

7.1. Punjab's Rice Procurement Model

Punjab has long been regarded as a benchmark for efficient government-led rice procurement in India. The state's structured procurement mechanism consistently ensures that over 90–95% of marketable paddy is procured at the Minimum Support Price (MSP), offering a stable income stream for farmers [11]. This success is rooted in robust institutional frameworks, including the active involvement of the Food Corporation of India (FCI), state procurement agencies, and a well-coordinated network of Agricultural Produce Market Committees (APMCs). Key to this model is the end-to-end digitization of procurement processes—right from farmer registration and issuance of receipts to real-time tracking of paddy movement and Direct Benefit Transfer (DBT) systems that ensure timely payment into farmers' bank accounts.

Moreover, the widespread availability of scientifically managed warehouses and covered storage facilities, combined with efficient logistics and milling infrastructure, reduces post-harvest losses and maintains grain quality. While this model is not without its challenges—such as groundwater overuse due to the state's paddy dominance—it remains a powerful example of how institutional support and technology integration can create a functional and farmer-centric procurement ecosystem. It also underscores the need for similar frameworks in eastern and northeastern India, where procurement infrastructure remains underdeveloped.

7.2. Organic Rice Clusters in Uttarakhand

In contrast to Punjab’s conventional, large-scale procurement model, Uttarakhand offers an exemplary case of community-led organic rice production targeting premium export markets. With the support of NGOs, local cooperatives, and schemes like the Paramparagat Krishi Vikas Yojana (PKVY), smallholder farmers in the Himalayan foothills have transitioned to certified organic rice farming. These organic rice clusters focus on traditional and indigenous rice varieties such as *Red Rice* and *Black Rice*, which are rich in antioxidants and increasingly sought after in health-conscious global markets.

Through robust traceability systems, certification from accredited organic bodies, and branding support, farmers have gained access to niche markets in Europe, the United States, and Southeast Asia. The value chain is further strengthened by local processing units, packaging centers, and e-commerce partnerships that allow for value addition and direct marketing. As a result, participating farmers have reported income increases of 40%–50%, reduced input costs, and improved soil and environmental health. This model exemplifies how sustainability, market orientation, and institutional support can be harmonized to uplift marginal farmers and promote agroecological farming systems.

8. Recommendations

To strengthen the Indian rice supply chain and make it more equitable, efficient, and sustainable, a multi-pronged strategy is essential. One of the foremost recommendations is to encourage the formation and scaling up of Farmer Producer Organizations (FPOs). These collective institutions can significantly reduce transaction costs, facilitate input aggregation, and enhance farmers' bargaining power in input and output markets. FPOs can also serve as a crucial bridge between farmers and institutional buyers, exporters, and government agencies, thereby improving access to finance, technology, and reliable markets.

Mechanization and precision agriculture technologies should be promoted to address low productivity and high labor dependency, especially in regions where agricultural labor is scarce or expensive. Tools like laser land levelers, mechanical transplanters, and drone-based spraying solutions can optimize input use and increase efficiency. Coupled with capacity building and financial support, such interventions can empower smallholder farmers to adopt modern techniques without compromising their economic viability.

Another critical step is to expand procurement infrastructure and Minimum Support Price (MSP) coverage across underrepresented rice-growing regions such as Eastern India and parts of the Northeast. Currently, states like Punjab and Haryana dominate MSP procurement due to historical and logistical advantages. A more inclusive procurement system—supported by adequate warehousing, logistics, and digital payment systems—would ensure price assurance and food security benefits reach marginalized farmers nationwide.

To enhance transparency and boost competitiveness in global markets, end-to-end digital traceability systems must be adopted across the supply chain. Blockchain and IoT-based platforms can track the movement, quality, and origin of rice, which is particularly important for meeting international food safety and sustainability standards. This would not only reduce malpractices but also increase consumer trust in Indian rice exports.

Support for climate-resilient agriculture is another pressing need. Government programs and subsidies should actively promote sustainable practices such as Alternate Wetting and Drying (AWD), the System of Rice Intensification (SRI), and the adoption of drought- and flood-resistant rice varieties. These approaches can help farmers mitigate the risks posed by erratic climate conditions while preserving critical natural resources like water and soil.

Lastly, improving labor rights monitoring and integrating ethical certification standards—especially in regions with high incidences of informal or child labor—is essential for both moral and market reasons. Ethical certifications can open up premium markets while ensuring that labor conditions meet international norms, thereby creating a more equitable and responsible rice supply chain.

9. Conclusion

India's rice supply chain, though robust in scale, needs modernization and sustainability-oriented interventions to remain globally competitive. Reducing post-harvest losses, improving storage and

processing, empowering farmers digitally, and enforcing environmental and labor standards are crucial. A synergy between policy reforms, private investment, and community participation can build a resilient, efficient, and ethical rice supply chain for the future.

References

1. Economic Times, "India's foodgrain production hits record 332.22 mn tonne in 2023-24", Economic Times, 2024. https://m.economictimes.com
2. ICRIER, "Reducing Post-Harvest Losses in Indian Agriculture – A Case Study", ICRIER, 2021. https://icrier.org/pdf/Policy_Brief_20.pdf
3. World-Grain, "From the editor: Promising news out of India", World-Grain, 2023. https://www.world-grain.com/articles/19718-from-the-editor-promising-news-out-of-india
4. FAO, "Rice Post-Harvest Technology in India", FAO, 2018. http://www.fao.org/3/i9243en/I9243EN.pdf
5. DesAgri, "Minimum Support Prices for Kharif Crops 2023-24", DesAgri, 2023. https://desagri.gov.in
6. Saadat, A., Barman, S., & Shukla, L. I., "Reduction of food wastage: Roles of administrative interventions and cultural ecosystem services". Zero Hunger, 2020.
7. Varma, P., "Adoption and the impact of system of rice intensification on rice yields and household income: an analysis for India". Applied Economics, 2019. https://doi.org/10.1080/00036846.2019.1606408
8. USAID, "India: Findings on the Worst Forms of Child Labor", USAID, 2020. https://www.dol.gov
9. MDPI, "Blockchain-Based Framework for Rice Supply Chain Transparency", MDPI, 2023. https://www.mdpi.com
10. IRRI, "Alternate Wetting and Drying in Indian Rice Fields", IRRI, 2022. https://www.irri.org
11. PIB, "Cabinet approves MSP for Kharif crops 2023-24", PIB, 2023. https://pib.gov.in