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Growth and trends of rice production in India (2026): A review

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Abstract
Rice (*Oryza sativa* L.) is one of the most important staple food crops in India and plays a vital role in ensuring national food security, rural employment and agricultural economic development. India is among the world's largest rice-producing countries and has experienced remarkable growth in rice production over the past seven decades. The increase in production has primarily resulted from the adoption of high-yielding varieties, expansion of irrigation facilities, improved agronomic practices, fertilizer application, mechanization and technological advancement. Rice production increased from approximately 20.58 million tonnes in 1950–51 to 150.18 million tonnes in 2024–25. According to the Third Advance Estimates released by the Ministry of Agriculture and Farmers Welfare in May 2026, rice production during 2025–26 is estimated at a record 154.024 million tonnes. This review examines the historical development, growth patterns, production trends, regional distribution, technological interventions and major constraints affecting rice production in India. It also discusses the role of climate-resilient varieties, water-saving technologies, direct-seeded rice, precision agriculture, improved nutrient management and government initiatives in enhancing productivity. Despite significant achievements, Indian rice production continues to face challenges associated with climate change, declining groundwater resources, soil degradation, rising cultivation costs and labour shortages. Sustainable rice production through resource-efficient technologies, improved varieties and integrated crop management is essential for maintaining long-term productivity and environmental sustainability.

Keywords: Rice, *Oryza sativa* L., Production trends, Productivity, India, Climate change, Agricultural development, Sustainable rice production

1. Introduction

Agriculture is one of the most important sectors of the Indian economy, providing livelihoods to a substantial proportion of the rural population. Among the major foodgrain crops, rice occupies a prominent position because of its importance in human nutrition, food security, employment generation and agricultural trade. Rice is cultivated under diverse agro-climatic conditions across India, ranging from irrigated plains to rainfed uplands, coastal regions and hill ecosystems.

Rice is the principal staple food for a large section of India's population. It is cultivated in different seasons, including Kharif, Rabi and summer, depending upon regional climatic conditions, availability of irrigation and cropping systems. The crop contributes significantly to national foodgrain production and supports millions of farmers, agricultural labourers, millers, traders and other stakeholders associated with the rice value chain.

India has witnessed substantial improvements in rice production since independence. During 1950–51, rice production was approximately 20.58 million tonnes, with an average productivity of 668 kg ha^{-1}. The development and dissemination of high-yielding varieties during the Green Revolution, together with improved irrigation, fertilizers and crop management practices, significantly increased productivity. By 2024–25, rice production reached approximately 150.18 million tonnes, with an average yield of 2,929 kg ha^{-1}.

The latest agricultural estimates indicate that India achieved another milestone during 2025–26. According to the Third Advance Estimates released on 27 May 2026 [1], rice production was estimated at 154.024 million tonnes, compared with 150.184 million tonnes in 2024–25. This represents an increase of approximately 2.56% over the previous year.

The growth of rice production is not only important for domestic food requirements but also strengthens India's position in international agricultural markets. However, increasing production through conventional resource-intensive practices has raised concerns regarding groundwater depletion, methane emissions, soil health and climate vulnerability.

Therefore, understanding the growth and changing trends of rice production is essential for developing effective agricultural policies and sustainable production strategies.

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2. Objectives of the review

The major objectives of this review are:

1. To examine the historical growth of rice production in India.
2. To analyse changes in rice area, production and productivity.
3. To identify major rice-producing states and their contributions.
4. To evaluate technological developments influencing rice production.
5. To assess the impact of government programmes and agricultural policies.
6. To identify major constraints affecting rice productivity.
7. To discuss future opportunities and sustainable strategies for rice production.

3. Methodology

The present review is based on secondary information collected from government publications, agricultural statistical reports, research articles, institutional reports and official agricultural databases. Major sources include the Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics, Indian Council of Agricultural Research (ICAR), Agricultural and Processed Food Products Export Development Authority (APEDA), and other relevant agricultural institutions.

Historical production statistics were examined to understand long-term changes in rice production and productivity. State-wise production data were analysed to identify regional differences. Recent production estimates for 2025–26 were considered to understand the current status of rice production in India.

The review also evaluates published information on improved varieties, irrigation management, nutrient management, mechanization, climate-resilient agriculture and sustainable rice production technologies.

4. Historical growth of rice production in India

Rice production in India has undergone considerable transformation since independence. Initially, production growth was relatively slow because of traditional cultivation practices, limited irrigation facilities, low fertilizer consumption, inadequate availability of improved seeds and dependence on monsoon rainfall.

The introduction of high-yielding varieties during the Green Revolution marked a major turning point in Indian rice cultivation. Improved varieties, including IR8 and subsequent semi-dwarf and high-yielding cultivars, contributed to substantial increases in grain yield.

The expansion of irrigation facilities, increased fertilizer use, improved plant protection measures and better agronomic practices further supported production growth.

4.1 Development during the pre-Green Revolution period

During the early post-independence period, Indian agriculture was characterized by low productivity and limited technological development. Rice production in 1950–51 was approximately 20.58 million tonnes, with an average yield of 668 kg ha^{-1}.

Farmers largely depended on traditional rice varieties that were often tall, lodging-prone and relatively low yielding. Inadequate irrigation and limited access to quality seeds also restricted productivity.

The increasing population and rising food requirements created an urgent need to improve agricultural production. Agricultural research and development programmes subsequently focused on developing improved crop varieties and increasing the availability of agricultural inputs.

4.2 Green Revolution and expansion of high-yielding varieties

The Green Revolution introduced major changes in rice production systems. The development of high-yielding varieties, particularly semi-dwarf cultivars, improved the response of rice plants to fertilizer application.

Improved irrigation infrastructure enabled farmers to adopt more intensive production practices. Fertilizer application, improved weed control, plant protection and better crop establishment practices also contributed to higher productivity.

During this period, rice production increased substantially, particularly in irrigated regions of northern and southern India.

4.3 Growth during the post-Green Revolution period

After the initial Green Revolution phase, rice production continued to increase through improvements in crop varieties, agricultural machinery, fertilizer management and irrigation infrastructure.

Research institutions developed varieties suitable for different agro-climatic conditions, including drought-prone, flood-prone, saline and rainfed areas.

The adoption of hybrid rice, improved seed replacement practices, integrated nutrient management and modern crop protection technologies further contributed to production growth.

4.4 Recent development in rice production

During recent decades, rice production has increased through improvements in productivity, expansion of cultivation in certain regions and adoption of modern agricultural technologies.

India produced approximately 137.82 million tonnes of rice during 2023–24, increasing to 150.18 million tonnes during 2024–25. The Third Advance Estimates for 2025 [1]–26 indicate a further increase to 154.024 million tonnes.

These figures demonstrate the continued importance of technological advancement, improved crop management and favourable production conditions in strengthening India's rice economy.

Table 1. Historical growth of rice production and productivity in India

Year	Production (million tonnes)	Yield (kg ha^{-1})
1950–51	20.58	668
1960–61	34.58	1,013
1970–71	42.22	1,123
1980–81	53.63	1,336
1990–91	74.29	1,740
2000–01	84.98	1,901
2010–11	95.98	2,239
2023–24	137.82	2,882
2024–25	150.18	2,929
2025–26*	154.024	Not reported here

2025–26: Third Advance Estimate; figures are provisional.

Source: Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare; Government of India, 2026.

The historical data indicate that rice production increased more than sevenfold between 1950–51 and 2024–25. This achievement reflects the combined contribution of agricultural research, improved crop varieties, irrigation development, fertilizer use and technological adoption.

5. Recent trends in rice production in India (2020–2026)

Recent years have witnessed considerable changes in Indian rice production. Improved varieties, favourable rainfall conditions in several production regions, improved input availability and technological interventions have supported higher production.

The 2020–21 to 2025–26 period is particularly important because India has maintained high levels of rice production despite challenges associated with climate variability, rising cultivation costs and changing agricultural practices.

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Table 2. Recent trends in rice production in India

Agricultural year	Rice production (million tonnes)
2023–24	137.82
2024–25	150.18
2025–26*	154.024

2025–26 figures are Third Advance Estimates.
Source: Ministry of Agriculture and Farmers Welfare, Government of India.

The production increase from 137.82 million tonnes in 2023–24 to 150.18 million tonnes in 2024–25 reflects a substantial improvement in national rice output. The estimated production of 154.024 million tonnes in 2025–26 further indicates a positive production trend.

However, advance estimates may be revised after the completion of final crop assessments. Therefore, the 2025–26 figure should be interpreted as a provisional estimate rather than a final production statistic.

6. State-wise distribution of rice production in India

Rice is cultivated in almost all major agricultural regions of India. However, production levels differ considerably among states because of variations in climatic conditions, irrigation infrastructure, soil characteristics, cultivated area, crop varieties and agricultural management practices.

According to the Agricultural Statistics at a Glance 2024–25, Uttar Pradesh, Telangana, West Bengal, Punjab and Chhattisgarh were among the major rice-producing states.

6.1 Uttar Pradesh

Uttar Pradesh emerged as the largest rice-producing state in 2024–25, contributing approximately 20.76 million tonnes. The state benefits from fertile alluvial soils, extensive irrigation facilities and favourable agro-climatic conditions.

The eastern and central regions of the state are particularly important for rice cultivation. Improved varieties, mechanization and irrigation management have contributed to increased productivity.

6.2 Telangana

Telangana is an important rice-producing state in southern India. Its rice production reached approximately 17.45 million tonnes in 2024–25.

The expansion of irrigation infrastructure, improved water availability and adoption of modern agricultural technologies have contributed to increased rice production.

6.3 West Bengal

West Bengal is traditionally recognized as one of India's major rice-producing regions. The state has favourable rainfall conditions, fertile soils and diverse rice-growing environments.

Rice is cultivated during different seasons, including Aus, Aman and Boro, depending on local climatic conditions and water availability.

6.4 Punjab

Punjab is characterized by high rice productivity due to extensive irrigation facilities, mechanization, high-yielding varieties and scientific crop management.

However, excessive dependence on groundwater irrigation and continuous rice-wheat cropping have created environmental concerns, particularly groundwater depletion and soil degradation.

6.5 Chhattisgarh

Chhattisgarh is popularly known as the Rice Bowl of Central India because of its traditional association with rice cultivation and the large number of farming households dependent on paddy production.

Rice is the dominant Kharif crop in many districts of the state. The major rice-growing regions include Raipur, Balod, Dhamtari, Mahasamund, Bilaspur, Janjgir-Champa, Raigarh, Surguja and other districts.

During 2024–25, Chhattisgarh produced approximately 10.37 million tonnes of rice, accounting for around 6.90% of India's total rice production.

The state has significant potential to increase rice productivity through the adoption of improved varieties, seed treatment, line transplanting, direct-seeded rice, integrated nutrient management, efficient irrigation and mechanization.

Special attention is also required for rainfed and upland rice ecosystems, where productivity is often affected by irregular rainfall, moisture stress and limited irrigation facilities.

7. Factors responsible for the growth of rice production

The growth of rice production in India is influenced by several technological, economic, institutional and environmental factors.

7.1 Development of high-yielding varieties

The development of high-yielding rice varieties has played a significant role in increasing national production. Modern varieties possess improved yield potential, better fertilizer response, desirable grain quality and resistance or tolerance to important biotic and abiotic stresses.

The development of region-specific varieties has enabled farmers to select suitable cultivars according to local climatic conditions, soil characteristics and cropping systems.

7.2 Expansion of irrigation facilities

Irrigation is an important factor influencing rice production, particularly in regions where rainfall distribution is irregular.

Canal irrigation, tube wells, bore wells and other water sources have helped farmers maintain adequate soil moisture during critical crop growth stages.

However, increasing dependence on groundwater has raised concerns regarding the sustainability of conventional flooded rice cultivation.

7.3 Balanced fertilizer application

Balanced nutrient management is essential for achieving higher rice productivity. Nitrogen, phosphorus and potassium are the primary nutrients required for crop growth and development.

The application of micronutrients, including zinc, iron and boron, is also important in areas where deficiencies occur.

Integrated nutrient management involving chemical fertilizers, organic manures, crop residues and biofertilizers helps maintain soil fertility and improve nutrient-use efficiency.

7.4 Improved crop establishment methods

Traditional transplanting methods are increasingly being supplemented by improved crop establishment techniques.

The major methods include:

- Conventional puddled transplanting.
- Mechanical transplanting.
- Direct-seeded rice.
- Drum seeding.
- Wet direct seeding.
- Dry direct seeding.

These methods can improve operational efficiency and reduce labour requirements when adopted under suitable agro-climatic conditions.

7.5 Agricultural mechanization

Mechanization has contributed significantly to the modernization of rice cultivation.

Important machinery includes rice transplanters, seed drills, combine harvesters, power weeders, threshers and paddy straw management equipment.

Mechanization reduces dependence on manual labour, improves operational timeliness and supports large-scale agricultural production.

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8. Role of modern technologies in rice production

Agricultural technological development has created new opportunities for increasing rice productivity while reducing production costs and environmental impacts.

8.1 Direct-seeded rice technology

Direct-seeded rice involves sowing rice seeds directly in the field rather than raising seedlings and transplanting them.

This technology can reduce labour requirements, nursery management costs and irrigation water consumption. It also offers opportunities for timely crop establishment.

However, successful adoption requires suitable land preparation, effective weed management, appropriate varieties and proper moisture management.

8.2 System of Rice Intensification (SRI)

The System of Rice Intensification is an alternative crop management approach involving younger seedlings, wider spacing, careful water management, mechanical weeding and improved soil aeration.

SRI practices can improve root growth, tillering and resource-use efficiency under suitable conditions.

The performance of SRI depends on local soil conditions, farmer skill, water availability and appropriate crop management.

8.3 Precision agriculture

Precision agriculture involves the application of modern technologies to improve agricultural decision-making.

Remote sensing, GPS, geographical information systems, drones, soil sensors and digital platforms can support crop monitoring and input management.

These technologies help identify variations in crop growth, soil fertility, moisture status and pest incidence.

8.4 Improved water management

Alternate Wetting and Drying (AWD) is an irrigation management technique in which rice fields are allowed to undergo controlled drying periods between irrigation events.

AWD can reduce irrigation water requirements and methane emissions without significantly affecting yield when properly implemented.

9. Government initiatives supporting rice production

The Government of India has implemented several agricultural programmes to enhance rice production, improve farmers' income and strengthen food security.

9.1 National Food Security Mission (NFSM)

The National Food Security Mission was introduced to increase the production of major foodgrain crops through area expansion, productivity improvement, quality seed distribution and technology demonstrations.

Rice has been an important crop under this programme.

9.2 Minimum Support Price (MSP)

The Minimum Support Price provides price support to farmers for eligible paddy procurement.

Government procurement through designated agencies helps protect farmers against sharp market price fluctuations and supports national foodgrain management.

10. Rice production and international trade

India occupies an important position in the international rice market. Indian rice is exported to several countries in Asia, Africa, the Middle East and other regions.

Basmati rice is particularly important because of its premium quality, aroma, grain length and international market demand. Non-basmati rice also contributes substantially to India's agricultural export earnings.

According to APEDA, India's rice export quantity increased from approximately 17.73 million metric tonnes in 2020–21 to 20.19 million metric tonnes in 2024–25.

The export value increased from USD 8.82 billion to USD 12.47 billion during the same period.

Major export destinations include Saudi Arabia, Benin, Iraq, Iran, Guinea, Côte d'Ivoire, the United Arab Emirates and Togo.

India's strong export position reflects its production capacity, diverse rice varieties, processing infrastructure and international market connectivity.

However, international rice trade is influenced by domestic food security requirements, export policies, global demand, exchange rates and international price movements.

Strengthening rice quality, traceability, food safety standards and processing facilities can further improve India's competitiveness in international markets.

11. Major constraints affecting rice production

Despite significant progress, rice production in India continues to face several challenges.

11.1 Climate change

Climate change is emerging as an important threat to rice production. Increasing temperatures, irregular monsoon rainfall, prolonged dry spells, floods and extreme weather events can adversely affect crop establishment, flowering, grain filling and final yield.

High temperature during flowering may cause spikelet sterility and reduce grain formation.

11.2 Water scarcity

Conventional flooded rice cultivation requires substantial quantities of water.

Groundwater depletion in major rice-growing regions, particularly northwestern India, has become a serious concern.

Efficient irrigation systems and water-saving cultivation technologies are essential to address this problem.

11.3 Soil degradation

Continuous rice cultivation, excessive fertilizer application, poor drainage and unbalanced nutrient management may contribute to soil degradation.

Declining soil organic carbon, micronutrient deficiencies and nutrient imbalances can reduce long-term productivity.

12. Sustainable strategies for future rice production

Future rice production must focus not only on increasing total output but also on improving resource-use efficiency, profitability and environmental sustainability.

12.1 Adoption of climate-resilient varieties

Development and dissemination of drought-tolerant, flood-tolerant, salinity-tolerant and heat-tolerant rice varieties should receive priority.

Region-specific varieties can help reduce production risks under changing climatic conditions.

12.2 Water-saving irrigation practices

Adoption of alternate wetting and drying, controlled irrigation, laser land levelling and suitable direct-seeded rice systems can reduce water consumption.

Efficient irrigation scheduling should be promoted according to soil moisture and crop growth stages..

13. Future prospects of rice production in India

- India has considerable potential to strengthen its position in global rice production through scientific research, improved agricultural infrastructure and sustainable crop management.

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- The estimated production of 154.024 million tonnes during 2025–26 indicates the continued growth potential of the Indian rice sector.
- However, future growth should not depend solely on expanding cultivated area or increasing irrigation and fertilizer consumption.
- Instead, the focus should shift towards increasing productivity per unit of land, water, energy and nutrients.
- Research institutions should prioritize the development of high-yielding, climate-resilient and nutrient-efficient rice varieties.
- Greater emphasis should also be placed on improving seed quality, strengthening agricultural extension services, expanding mechanization and promoting farmer-oriented technologies.
- The adoption of sustainable rice cultivation practices can reduce production costs, improve resource-use efficiency and minimize environmental impacts.
- Furthermore, the development of value-added rice products, improved processing infrastructure and export-oriented quality management can create additional economic opportunities.

Table 3. Major rice-producing states in India during 2024–25

State	Production (million tonnes)	Share (%)
Uttar Pradesh	20.76	13.82
Telangana	17.45	11.62
West Bengal	16.02	10.67
Punjab	14.36	9.56
Chhattisgarh	10.37	6.90
Odisha	9.53	6.34
Madhya Pradesh	9.11	6.07
Bihar	8.30	5.53
Andhra Pradesh	8.16	5.43
Tamil Nadu	7.09	4.72
All India	150.18	100.00

Source: Agricultural Statistics at a Glance 2024–25, Ministry of Agriculture and Farmers Welfare.

14. Conclusion

Rice production in India has experienced remarkable growth since independence, increasing from approximately 20.58 million tonnes in 1950–51 to 150.18 million tonnes in 2024–25. The Third Advance Estimates for 2025 [1]–26 indicate a further increase to 154.024 million tonnes, demonstrating the continued importance of rice in India's agricultural development and food security.

The growth of rice production has been supported by high-yielding varieties, irrigation expansion, improved nutrient management, mechanization, agricultural research and government interventions. Uttar Pradesh, Telangana, West Bengal, Punjab and Chhattisgarh are among the leading rice-producing states.

Despite these achievements, climate change, groundwater depletion, soil degradation, rising production costs and labour shortages remain significant challenges.

Future rice production strategies should focus on climate-resilient varieties, efficient water management, integrated nutrient management, precision agriculture, mechanization and sustainable crop establishment practices.

The integration of modern agricultural technologies with locally suitable traditional knowledge can improve productivity and farm profitability while protecting natural resources.

Therefore, sustainable intensification of rice cultivation will be essential for maintaining India's food security, strengthening farmers' livelihoods and ensuring long-term agricultural sustainability.

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