



A Season-wise Analysis of the Extent of Adoption of Popular Rice Varieties in Telangana, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Rice is a vital staple food worldwide, serving as a major source of calories for a significant portion of the global population. In India, where agriculture plays a pivotal role in the economy, rice production has witnessed remarkable growth over the past few decades. This growth is supported by advancements in agricultural technology, including the introduction of high-yielding seeds, chemical fertilizers, and agrochemicals. India stands as a key player in rice production, covering vast areas and contributing significantly to the nation's food grain output.

Telangana, a state in India, has seen a substantial increase in paddy production, owing to government initiatives, irrigation projects, and investments. The development of high-yielding rice varieties that are well-suited to the region's soil conditions has played a crucial role in this growth. These varieties exhibit resistance to various biotic and abiotic stresses, contributing to a sustained increase in paddy production. The state's remarkable progress in rice cultivation is evident through the data on area coverage, production, and productivity. The study delves into the area coverage of

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popular rice varieties across seasons in Telangana. It reveals that coarse and fine rice varieties dominate *Kharif* and *Rabi* seasons, respectively, with MTU 1010 being the most extensively cultivated. This article provides valuable insights into the extent of adoption of popular rice varieties among farmers of Telangana.

Keywords: *Agrarian economy; rice production; Telangana; high-yielding varieties; popular paddy varieties.*

1. INTRODUCTION

India is primarily an agrarian economy, with about 54.6 percent of the total population employed in the agricultural and allied sector (Census, 2011). The previous two years have seen brisk expansion in the agriculture industry. The industry, which employs the most people, contributed a significant 18.8% (2021–2022) of the country's Gross Value Added (GVA), growing by 3.6% in 2020–2021 and 3.9% in 2021–2022 [1]. The main factors influencing the sector's overall growth have been expansion in related industries including cattle, dairying, and fishing.

The introduction of high-yielding seeds, chemical fertilisers, and agrochemicals has sparked technological transformation and this change is also supported by investments in irrigation, infrastructure, and institutions (such as credit and extension services), as well as by ongoing legislative support (procurement of output by the central government at pre-fixed prices and provision of input subsidies) [2].

Rice is one of the most popular staple foods consumed worldwide and is also an excellent source of complex carbohydrates. It is a crucial source of calories for around 50% of the world's population and the primary food supply for rural residents in the majority of low-income nations [3].

Rice is the world's second most important cereal crop following only corn. In the most recent harvest year (2020/2021), about 518.5 million metric tonnes of milled rice were produced globally (Source: FAOSTAT, 2021). Historically, Asia has produced most of the world's rice. China was the world's top producer of paddy for the year 2020/2021, followed by India with a production of over 148.3 million metric tonnes [4].

FAO during the International Year of Rice stated that “ Rice contributes too many aspects of society and therefore can be considered a crystal

or prism through which the complexities of sustainable agriculture and food systems can be viewed. Rice has shaped the culture, diets and economy of thousands of millions of peoples. For more than half of the humanity “rice is life”. The issues related to rice production should not be viewed in isolation but in the framework of agricultural production systems through ecological and integrated systems.

In India, rice is one of the most important staple food crops, in terms of both consumption and production. India's rice production increased tremendously in the past five decades, from 30.44 million tons in 1966-67 to 122.27 million tonnes in 2020-21 (India, MoAFW, Annual report 2021-22). Since rice is one of the key staple foods in the world, productivity improvements in the rice industry are crucial to achieving this objective, especially in Asia where there is no room for land development (Ravindra, 2016).

In India, rice occupies one third of the total cropped area and contributes 40 per cent of total food grain production in the country. India, being the leading rice producing country in the world, stands first in terms of area and second in production, covering an area of about 45.07 million ha and production of 122.27 million tonnes of rice with an average productivity of 2713 kg/hectare in 2020-21 (Source: Agricultural Statistics at a glance, 2021).

Rice is the staple food crop of India and occupies highest area among all the crops grown in the country [5]. Rice is grown under varying eco-systems on a range of soils under varying climatic and hydrological conditions ranging from waterlogged and poorly drained to well drained situations. Rice is also grown in different ecologies from irrigated to upland, rain-fed lowland, deep water and very deep or tidal wetland ecologies. In India more than 1200 rice varieties have been released till now which are suitable for different ecosystems and widely used by the farmers all over the country [6].

Table 1. Top 10 leading rice producing states in India

S. No	State	Area (million ha)	Production (million tonnes)	Yield (kg/ha)
1.	West Bengal	5.58	16.65	2984
2.	Uttar Pradesh	5.68	15.66	2759
3.	Punjab	2.79	12.18	4366
4.	Odisha	4.03	8.77	2173
5.	Andhra Pradesh	2.32	7.89	3395
6.	Telangana	2.31	7.70	3327
7.	Tamil Nadu	2.04	7.28	3574
8.	Chhattisgarh	3.79	7.16	1889
9.	Bihar	3.02	6.88	2276
10.	Assam	2.36	5.26	2224

Source: *Agricultural Statistics at a Glance, 2021 and author's calculations*

Many studies have proven the impact of improved/popular rice varieties on the yield and farmer's income/output globally. According to the official statistics, modern rice varieties played a key role in boosting Bangladesh's annual rice production from 9.93 million tonnes in 1972-73 to nearly 34.94 million tonnes in 2016-17 to feed 160 million people [7]. A study was conducted among a group of smallholder farmers in south-western Nigeria. The mean yield of improved rice varieties (1.601 tons/ha) was significantly higher than the yield of the local varieties (1.154 tons/ha) with a yield advantage of 38.7% [8].

HYVs have brought real and substantial increases in production as they can respond to increasing application of fertilizer resulting in higher yields and, in part, to produce two or sometimes even three, crops a year. The benefits of HYVs are significant. As intended, these have decreased the reliance of developing countries on food grain imports, despite rising population [9].

1.1 Paddy Production in Telangana

Paddy is the major staple food crop of the state, during the 2021-22 year about 39.19 lakh ha (97.97 lakh acres) area was covered under paddy (Directorate of Economics and Statistics (DES), Telangana, 2021-22). In 2015-16, total area cultivated under Paddy was around 25.85 lakh acres and by the end of 2020-21, it increased to nearly 303% to 104 lakh acres and also the production was around 45 lakh tonnes and by 2020-21, paddy production was increased

nearly to 378% to 218.5 lakh tonnes. This increase can be attributed to the sustained investment in irrigation projects and paddy procurement by the Government, which has made it possible for farmers to cultivate paddy in both seasons of the year [10-12].

From the above Table, it is clearly evident that the state's impressive progress in paddy cultivation, characterized by substantial increases in both the area under cultivation and overall production. The relatively stable productivity per acre reflects the state's commitment to maintaining efficient farming practices and achieving significant contributions to food grain production.

Apart from the Government schemes and irrigation projects, the sustainable increase in the paddy production was achieved mainly through the development of HYVs which are suitable to the soil conditions of the state. Most of the high yielding rice varieties developed in the state are resistant to biotic (BPH, Blast and BLB) and abiotic (cold tolerance) stresses. Many institutes like Agricultural Research Institute (ARI), Indian Institute of Rice Research (IIRR), Professor Jayashankar Telangana State Agricultural University (PJTSAU) and other regional agricultural research stations in Telangana have combinedly put their efforts in developing high yielding rice varieties which are now widely used by the farmers all over the state. The main objective of this article is to examine the extent of adoption of rice varieties in Telangana across seasons.

Table 2. Area, production and productivity of paddy in Telangana

Year	Area (m ha)	Production (M Tonnes)	Productivity (Kg/ha)
2014-15	1.40	6.80	4873
2015-16	1.03	4.60	4420
2016-17	1.80	9.90	5476
2017-18	1.94	9.40	4853
2018-19	1.90	10.0	5239
2019-20	3.18	18.0	5608
2020-21	4.17	22.0	5241
2021-22	3.90	20.2	5159

Source: Telangana State Statistical Abstract and author's calculations

2. METHODOLOGY

The information related to the area coverage of popular rice varieties in Telangana across seasons (2021-22) is collected from Directorate of Economics and Statistics (DES), Telangana. Apart from the secondary data, the study also conducted a survey in 10 districts of Telangana covering the sample size of 400 paddy farmers in-order to know the wide range of varieties cultivated across the state.

3. RESULTS AND DISCUSSION

The key findings related to the cultivation of popular rice varieties in Telangana during both the *Kharif* and *Rabi* seasons for the crop year 2021-22 has been analysed with the help of the data presented in Tables 3 and 4. The results offer valuable insights into the distribution of rice varieties, highlighting the dominance of certain varieties in different seasons.

Table 3. List of Popular rice varieties cultivated across Telangana, 2021-22

S.No	Category	Variety name	<i>Kharif</i> season- Area (million hectares~ m ha)	Percentage Share in area (m ha)
Coarse varieties				
1.	Coarse varieties	MTU 1010	1.20	76.43%
2.	Coarse varieties	MTU 1001	0.13	8.28%
3.	Coarse varieties	KNM 118	0.07	4.45%
4.	Coarse varieties	IR 64	0.04	2.54%
5.	Coarse varieties	JGL 24423	0.04	2.54%
6.	Coarse varieties	RNR 10754 (Tella Hamsa)	0.01	0.63%
7.	Coarse varieties	Others	0.08	5.09%
Coarse varieties Total:			1.57	100%
Fine varieties				
1.	Fine varieties	BPT 5204	0.30	35.29%
2.	Fine varieties	Telangana Sona (RNR 15048)	0.17	20.00%
3.	Fine varieties	Chintu	0.08	9.41%
4.	Fine varieties	MTU 1061	0.07	8.23%
5.	Fine varieties	Jai Sriram	0.03	3.52%
6.	Fine varieties	MTU 1262	0.02	2.35%
7.	Fine varieties	MTU 1224	0.02	2.35%
8.	Fine varieties	Aman gold	0.02	2.35%
9.	Fine varieties	Others	0.14	16.47%
Fine varieties Total:			0.85	100%

Source: (DES, Telangana, 2021-22)

From the above table, it is clear that coarse varieties dominate *Kharif* season, accounting for a substantial 76.43% of the total area under paddy cultivation. MTU 1010 is the most prominent coarse variety, covering a vast area of 1.20 m ha, indicating its popularity and suitability for the region. While other coarse varieties also contribute significantly, they collectively make up 23.57% of the total area.

Fine varieties make up the remaining 35.12% of the total area under paddy cultivation. BPT 5204 is the most extensively cultivated fine variety, covering 35.29% of the area, while Telangana Sona (RNR 15048) is the second most popular fine variety, representing 20% of the area, followed by other fine varieties, each with varying percentages. Collectively, the fine varieties demonstrate diversity in cultivation and

contribute to a significant portion of the overall paddy cultivation area.

From the below Table 4, it is clear that coarse varieties continue to dominate in the Rabi season also, covering a substantial area of 1.170 m ha. MTU 1010 remains the most extensively cultivated coarse variety, occupying a significant 85.47% of the total area. It is quite significant that MTU 1010 is the most favourite, while other coarse varieties collectively contribute to 14.47% of the total area.

Fine varieties cover a smaller but significant area of 0.255 m ha during the Rabi season. While BPT 5204 dominated the *Kharif*, Telangana Sona (RNR 15048) is the most prominent fine variety in Rabi season, occupying 23.52% of the total area. GK Kaveri and Chintu are the second and third most popular fine varieties, representing 15.68% and 15.68% of the area, respectively.

Table 4. List of popular rice varieties cultivated across Telangana, 2021-22

S.No	Category	Variety name	Rabi season- Area (m ha)	Percentage Share in area (m ha)
Coarse varieties				
1.	Coarse varieties	MTU 1010	1.000	85.47%
2.	Coarse varieties	KNM 118	0.040	3.41%
3.	Coarse varieties	IR 64	0.030	2.56%
4.	Coarse varieties	JGL 24423	0.030	2.56%
5.	Coarse varieties	MTU 1156	0.010	0.85%
6.	Coarse varieties	MTU 1153	0.010	0.85%
7.	Coarse varieties	RNR 10754	0.010	0.85%
8.	Coarse varieties	(Tella Hamsa) Kaveri 468	0.009	0.76%
9.	Coarse varieties	MTU 1001	0.007	0.59%
10.	Coarse varieties	12 KA 4 Siri Seeds	0.004	0.34%
	Coarse varieties	Others	0.020	1.70%
Coarse varieties Total:			1.170	100%
Fine varieties				
1.	Fine varieties	Telangana Sona (RNR 15048)	0.060	23.52%
2.	Fine varieties	GK Kaveri	0.040	15.68%
3.	Fine varieties	Chintu	0.040	15.68%
4.	Fine varieties	HMT	0.024	9.41%
5.	Fine varieties	BPT 5204	0.020	7.84%
6.	Fine varieties	GK Chetana	0.011	4.31%
7.	Fine varieties	HMT SONA	0.009	3.52%
8.	Fine varieties	Aman Gold	0.007	2.74%
9.	Fine varieties	Seed Production Others	0.006	2.35%
10.	Fine varieties	Akshaya	0.005	1.96%
	Fine varieties	Others	0.033	12.94%
Fine varieties Total :			0.255	100%

Source: (DES, Telangana, 2021-22)

Table 5 List of paddy varieties grown by the farmer

S.No	Category	Variety name	Number of farmers cultivating the variety	
			Kharif season	Rabi season
Coarse varieties				
1.	Coarse varieties	MTU 1010	169	161
2.	Coarse varieties	KNM 118	7	16
4.	Coarse varieties	JGL 24423	10	8
5.	Coarse varieties	MTU 1153	3	8
6.	Coarse varieties	MTU 1156	1	9
Fine varieties				
1.	Fine varieties	BPT 5204	102	38
2.	Fine varieties	Jai Sriram	88	27
3.	Fine varieties	Chintu	70	58
4.	Fine varieties	Aman Gold	36	16
5.	Fine varieties	HMT	23	30
6.	Fine varieties	GK Kaveri	6	44
7.	Fine varieties	Mahendra 3030	6	9
8.	Fine varieties	Telangana Sona (RNR 15048)	3	2
9.	Fine varieties	Pooja Gold	2	0
10.	Fine varieties	Chittipotti	1	5

Source: (Primary data collected from June 2023- August 2023)

3.1 Paddy Varieties Cultivated by the Farmers of Telangana

A summary of rice farming is given in Table 5, categorizing varieties into coarse and fine types and also lists the number of farmers cultivating each variety throughout the Kharif and Rabi seasons. The most often grown coarse variety is MTU 1010, and the most widely grown fine variety is BPT 5204. The distribution of cultivation across Kharif and Rabi seasons indicates seasonal preferences and adaptability. While some varieties including Jai Sriram and Chintu, are consistently grown, but other cultivars exhibit fluctuations, which is indicative of the dynamic nature of farming methods. This information is valuable for agricultural planning, resource allocation, and understanding the diversity of rice cultivation in the region. The data highlights varying degrees of popularity among different rice varieties, influencing cultivation patterns across seasons in the state.

Coarse Varieties:

- ❖ **MTU 1010:** The most widely cultivated coarse variety, with 169 farmers in the Kharif season and 161 farmers in the Rabi season.
- ❖ **KNM 118:** Cultivated by a smaller number of farmers compared to MTU 1010, with 7 farmers in the Kharif season and 16 farmers in the Rabi season.

- ❖ **JGL 24423:** Another coarse variety with moderate cultivation, having 10 farmers in the Kharif season and 8 farmers in the Rabi season.
- ❖ **MTU 1153 and MTU 1156:** These varieties have relatively lower cultivation, with single-digit farmer numbers.

Fine Varieties:

- ❖ **BPT 5204:** The most popular fine variety, cultivated by 102 farmers in the Kharif season and 38 farmers in the Rabi season.
- ❖ **Jai Sriram:** Close in popularity to BPT 5204, with 88 farmers in the Kharif season and 27 farmers in the Rabi season.
- ❖ **Chintu:** Another fine variety with significant cultivation, having 70 farmers in the Kharif season and 58 farmers in the Rabi season.
- ❖ **Aman Gold, HMT and GK Kaveri:** These varieties show varying levels of cultivation.
- ❖ **Mahendra 3030, Telangana Sona(RNR 15048), Pooja Gold and Chitti potti:** These fine varieties have relatively lower cultivation, with some having minimal or no cultivation in certain seasons.

In conclusion, the table reflects the distribution of farmers cultivating different rice varieties in both Kharif and Rabi seasons, showcasing the preferences and adoption patterns among the farmers.

4. SUMMARY AND CONCLUSION

Rice holds a critical position in India's agriculture-driven economy, supporting a substantial portion of its population. Over the past decades, rice production has surged, primarily due to advancements in agricultural practices, including the adoption of high-yielding seeds, fertilizers, and agrochemicals. Additionally, investments in irrigation, infrastructure, and government policies have contributed to this growth. India is a global leader in rice production, with Telangana emerging as a prominent contributor. The state has witnessed a remarkable expansion in paddy cultivation, supported by government initiatives and sustained investments. One significant factor in this progress is the development of high-yielding rice varieties tailored to the region's unique soil conditions. These varieties not only offer increased yields but also exhibit resistance to various pests and environmental stressors.

The success story of Telangana's rice production is exemplified by a substantial increase in both area coverage and productivity. This achievement can be attributed to the combined efforts of various agricultural research institutes and universities. They have played a pivotal role in developing and promoting high-yielding rice varieties that are now widely adopted by farmers across the state. The data on popular rice varieties in Telangana illustrates farmers' preferences and the role of specific varieties in the region's agriculture. Coarse varieties, notably MTU 1010, continue to be favoured, while fine varieties like Telangana Sona and BPT 5204 also play a crucial role. In conclusion, the article provides a comprehensive overview of the significance of rice in India's agriculture, and highlights the dominance of specific rice varieties in Telangana's agricultural landscape during both *Kharif* and *Rabi* seasons.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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