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Study of Trends in Crop Production of Paddy: A State-Wise Analysis

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Abstract – Paddy is a major food crop in India and plays a vital role in ensuring food security and supporting rural livelihoods. The present study examines the state-wise trends in paddy cultivation with specific focus on changes in area, production, and productivity across major rice-growing states of India. The analysis is based on secondary time-series data collected from official agricultural statistics and published research sources. Statistical tools such as trend analysis, compound annual growth rate, and instability measures are employed to assess growth patterns and variations over time. The results reveal significant regional disparities in paddy performance, with some states showing steady growth in productivity due to improved irrigation and technology, while others experience declining area and production influenced by climatic and socio-economic factors. The study highlights the importance of region-specific policies, efficient resource management, and climate-resilient practices to sustain paddy production. The findings provide useful insights for agricultural planners and policymakers in improving rice production and ensuring long-term sustainability.

Keywords - Paddy cultivation; Rice production; State-wise analysis; Area, production and productivity; Growth trends; Compound annual growth rate; Regional disparities; Agricultural sustainability; Climate variability; India.

I. INTRODUCTION

Agriculture remains a cornerstone of the Indian economy, contributing significantly to employment, income generation, and national food security. A large share of India's population continues to depend directly or indirectly on agricultural activities for their livelihood. Among the various crops cultivated in the country, paddy holds a place of prime importance as it constitutes the staple food for a major portion of the population. The performance of paddy cultivation therefore has a direct bearing on food availability, price stability, and overall economic well-being, particularly in rural areas.

India is one of the leading producers of rice globally, owing to its vast geographical area and diverse agro-climatic conditions. Paddy is grown in a wide range of environments, from rain-fed lowlands and irrigated plains to deltaic and coastal regions. The crop is cultivated predominantly during the Kharif season, although Rabi and summer rice have gained importance in several states due to the expansion of irrigation facilities. Despite its widespread cultivation, paddy production in India is not uniform across regions. Differences in climate, soil quality, access to water resources, technological adoption, and institutional support have resulted in considerable variation in production patterns among states.

Over the past few decades, India's paddy sector has experienced notable transformations. Technological advancements such as the introduction of high-yielding varieties, improved fertilizer use, mechanization, and better crop management practices have contributed to increases in productivity in several regions. In addition, government interventions including the Minimum Support Price (MSP), procurement policies, and investments in irrigation infrastructure have played a crucial role in encouraging paddy cultivation. These efforts have helped the country achieve higher levels of rice production and maintain food self-sufficiency. However, the growth in paddy production has been accompanied by emerging challenges. Climate variability, irregular monsoon patterns, frequent floods and droughts, and rising temperatures have increasingly affected rice cultivation. Water scarcity, especially in traditionally high-producing states, has raised concerns about the sustainability of paddy farming. Furthermore, increasing costs of inputs such as seeds, fertilizers, labor, and energy have reduced profitability for farmers in certain regions.

These contrasting developments have resulted in uneven growth trends across Indian states. While some states have achieved substantial gains in productivity and output, others have experienced stagnation or decline in either cultivated area or production levels. Such regional disparities underline the importance of conducting a detailed state-wise analysis to understand the dynamics of paddy cultivation. Examining trends in area, production, and productivity helps in identifying whether growth is driven by expansion of cultivated land, improvements in yield, or a combination of both. It also allows for the assessment of production instability and long-term sustainability of paddy farming.

A state-wise trend analysis provides valuable insights into the effectiveness of agricultural policies and technological interventions at the regional level. By analyzing changes over time, researchers can identify states that have performed well and those that require policy attention. This information is essential for designing region-specific strategies aimed at enhancing productivity, reducing production risks, and ensuring efficient use of natural resources.In this context, the present study focuses on analyzing the trends in paddy cultivation across major rice-producing states of India using secondary data. The study

examines changes in area, production, and productivity over time and applies statistical tools to measure growth rates and variability. By highlighting regional differences and underlying factors influencing paddy production, the study aims to contribute to informed agricultural planning and policy formulation. The findings are expected to support efforts toward sustainable rice production and long-term food security in India.

Statement of the problem

Paddy is the most important food crop in India, playing a vital role in ensuring food security, rural employment, and agricultural income. Despite significant progress in rice production at the national level, wide inter-state disparities persist in terms of area, production, and yield. Some states have achieved high productivity through intensive use of irrigation, modern technology, and institutional support, while others continue to rely on traditional practices and remain vulnerable to climatic variability. These disparities raise concerns about the sustainability and equity of growth in paddy production across regions.

Moreover, recent years have witnessed challenges such as climate change, water scarcity, rising input costs, and production instability, which have affected paddy cultivation differently across states. In many regions, production growth has slowed or become highly unstable due to dependence on monsoon rainfall and inadequate infrastructure. While several studies have examined rice production at the national or regional level, there is a lack of comprehensive state-wise analysis focusing on recent trends, especially covering the last decade.

Understanding the changing patterns of paddy cultivation, growth trends, yield performance, and regional imbalances is essential for designing effective, region-specific agricultural policies. Therefore, the present study attempts to analyze state-wise trends in paddy production in India to identify key growth patterns, productivity gaps, and policy-relevant issues that influence sustainable rice production

Objective of the study:

To examine the state-wise trends in area, production, and productivity of paddy in major riceproducing states of India over the study period.

To estimate the growth rates and variability in paddy cultivation across selected states using appropriate statistical measures.

To compare the performance of different states in terms of paddy production and yield levels and identify regional disparities.

Scope of the study:

The scope of the present study is confined to a state-wise analysis of paddy production in India, covering a period of the last ten years. The study focuses on major paddy-producing states to capture regional variations in area, production, and yield. It examines growth trends, productivity performance, and inter-state differences using secondary data obtained from official and published sources.

The analysis includes the estimation of growth rates and comparative yield performance across states to identify high-performing and low-performing region.

II. REVIEW OF LITERATURE

The literature on rice production in India consistently highlights long-term structural changes, regional disparities, technological influences, and climate-induced challenges affecting area, production, productivity, and stability across states and districts. Early evidence by Savadatti (2018), based on an extensive dataset from 1950-51 to 2016-17, shows that India's rice output initially expanded through area increases but gradually shifted toward productivity-driven growth with the adoption of modern varieties and improved agronomic practices, indicating a transition from land-augmenting to technology-augmenting growth pathways. Subsequent research strengthens this observation. Sekar (2024), examining recent supply dynamics, confirms that both area expansion and yield improvements have contributed to rice growth, though their relative importance varies across states depending on irrigation access, technological adoption, and climatic stability. Studies focusing on premium segments such as Basmati rice further reveal the growing significance of productivity and export orientation; Dalal et al. (2024) demonstrate that during 2001–2021, Basmati production growth was primarily yield-driven, while area and climate variability contributed to instability, and export performance closely mirrored domestic production fluctuations and global demand changes. Parallel analyses on broader cereal systems indicate similar shifts: Handral et al. (2017, cited 2024) report that rice productivity improved substantially between 1990-91 and 2012-13 due to modern varieties and better management, although inter-state disparities persisted. Focusing specifically on efficiency, Handral et al. (2024) estimate total factor productivity (TFP) for rice across 12 major states from 1991-92 to 2015-16 and identify irrigation, technological progress, and improved farm practices as major determinants of efficiency growth, while states with weaker resource bases lagged behind. Regional and district-level studies also highlight significant heterogeneity in performance. Longkumer and Giribabu (2019), focusing on the North-East, show that despite national gains, the region continues to experience constraints such as low mechanization, inadequate irrigation, and vulnerability to climatic variability, underscoring the need for tailored interventions. At the sub-state level, Jambhulkar et al. (2024) in West Bengal and Mondal et al. (2024) in Maharashtra find stark district-wise differences in growth and instability, driven largely by irrigation access, technological penetration, and climatic conditions, with rain-fed districts exhibiting chronic output fluctuations.

Broader zone-wise assessments by Sindhuja and Malik (2025) further reveal that while productivity improvements contributed significantly to growth across most zones from 1990-91 to 2021-22, monsoon-dependent regions faced higher instability, indicating the persistent sensitivity of rice cultivation to rainfall variability. Several studies specifically examine profitability, market orientation, and varietal adoption. Singh et al. (2021) show that states with higher yields, efficient input use, and modern cultivation practices enjoy better profitability and stable growth, while traditional systems show lower returns and greater exposure to risk. Udhayakumar et al. (2021), comparing Basmati and non-Basmati rice across states from 1980-81 to 2018-19, find that despite occupying a smaller area, Basmati rice achieved higher productivity and export intensity, whereas non-Basmati rice remained dominant in domestic food security, pointing to dual production systems shaped by market incentives and consumption patterns. Further emphasizing the role of technology, Satish et al. (2024) document that season-wise adoption of improved rice varieties in Telangana significantly enhances stability and yield performance, reiterating the importance of technology dissemination and farmer awareness. State-specific studies reinforce these findings: Pyati and Katti (2024) report that Karnataka's paddy production from 2012-13 to 2021-22 grew steadily due to yield gains driven by improved varieties, irrigation, and better crop management, although regional disparities persisted. Similarly, Kumar et al. (2024), comparing Bihar and Punjab, reveal major economic and yield differences arising from mechanization intensity, input use efficiency, and resource availability, with Punjab achieving significantly higher profitability and productivity relative to Bihar.

Climate variability emerges as a recurring challenge across the literature. Ghosh et al. (2025), examining rainfall risk in Maharashtra using volatility models, find that rainfall variability significantly influences rice output, particularly in rain-fed regions, increasing production instability and underscoring the need for climate-resilient technologies, irrigation expansion, and risk-mitigation strategies. Collectively, these studies reveal that while India has made substantial progress in rice production through technological advancement, improved varieties, and input efficiency, the benefits remain unevenly distributed across states, zones, and districts due to differences in irrigation, resource access, mechanization, and vulnerability to climatic shocks. The literature converges on the conclusion that sustaining rice production growth in India requires a dual focus on enhancing productivity through technology and input efficiency, and stabilizing output through region-specific interventions, irrigation expansion, climate-resilient strategies, and targeted support for lagging regions.

III. METHODOLOGY

The present study is based entirely on secondary data collected from reliable and published sources. State-wise data on area, production, and productivity of paddy were obtained from the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers' Welfare, Government of India, along with state agricultural reports and relevant research publications. The study covers a specified time period to capture long-term trends in paddy cultivation across major rice-producing states.

To analyze trends, time-series analytical techniques were employed. Growth in area, production, and yield was estimated using the Compound Annual Growth Rate (CAGR) method. Trend patterns were examined through linear and exponential trend models to assess changes over time. Variability in paddy production was measured using an instability index, which helps in understanding year-to-year fluctuations.

The collected data were tabulated and analyzed using statistical tools. Comparative analysis was carried out to examine inter-state differences in paddy performance. The results were presented using tables and graphs to facilitate clear interpretation of trends and regional variations in paddy cultivation.

Analysis:

Table: 01-State-Wise Area, Production and Yield of Paddy

State	Area(Lakhs)	Production(Lakh tonnes)	Yields(Kg)
West Bengal	55.0	160.0	2900
Uttar Pradesh	58.5	155.0	2650
Punjab	31.0	125.0	4200
Andhra Pradesh	22.0	80.0	3600
Tamil Nadu	19.5	65.0	3400
Odisha	41.0	95.0	2300
Chhattisgarh	38.0	90.0	2350
Bihar	33.0	85.0	2550

Sources: Directorate of Economics and Statistics (DES), Ministry of Agriculture and Farmers Welfare, Government of India; Agricultural Statistics at a Glance (various issues). Data compiled from state agricultural reports and FAOSTAT for validation.

Interpretation:
Table 01 presents a comparative overview of state-wise area, production, and yield of paddy, revealing substantial regional variations in cultivation patterns and productivity performance. West Bengal and Uttar Pradesh emerge as the leading states in terms of area under paddy cultivation, accounting for the largest share of total production. Their dominance is primarily due to favorable agroclimatic conditions, availability of traditional rice-growing ecosystems, and the crop's central role in regional food consumption. However, despite their extensive area coverage, yield levels in these states remain moderate, suggesting scope for further productivity enhancement.

Punjab, though having a relatively smaller area under paddy cultivation, records the highest yield among all states. This reflects the impact of assured irrigation, widespread mechanization, use of high-yielding varieties, and efficient input management practices. The state's production strategy is clearly productivity-driven rather than area-driven, demonstrating how technological intensification can compensate for limited land availability.y.

Andhra Pradesh and Tamil Nadu show a balanced performance, with comparatively higher yields supported by improved irrigation systems, adoption of modern cultivation practices, and effective extension services. These states highlight the potential benefits of integrating technology with efficient water management.

In contrast, eastern states such as Odisha, Chhattisgarh, and Bihar exhibit lower yield levels despite having sizable areas under paddy cultivation. This lower productivity can be attributed to factors such as dependence on monsoon rainfall, frequent exposure to floods or droughts, limited mechanization, and inadequate access to quality inputs. The findings emphasize the need for infrastructure development, irrigation expansion, and targeted technological interventions in these regions to reduce regional disparities and enhance overall paddy productivity.

Table 2: Growth Rate of Paddy Production (CAGR)

State	Period	CAGR(%)
West Bengal	2000-01 to 2021-22	1.8
Uttar Pradesh	2000-01 to 2021-22	1.5
Punjab	2000-01 to 2021-22	0.6
Andhra Pradesh	2000-01 to 2021-22	2.4
Tamil Nadu	2000-01 to 2021-22	2.1
Odisha	2000-01 to 2021-22	2.6
Chhattisgarh	2000-01 to 2021-22	2.8
Bihar	2000-01 to 2021-22	2.0

Sources: Directorate of Economics and Statistics (DES), Ministry of Agriculture and Farmers Welfare, Government of India; Agricultural Statistics at a Glance (various issues). CAGR computed by the author using state-wise paddy production data for the period 2000-01 to 2021-22.

Interpretation:
Table 2 presents the compound annual growth rate (CAGR) of paddy production across selected Indian states over the period 2000-01 to 2021-22, highlighting significant inter-state differences in growth performance. The results indicate that paddy production growth has not been uniform across regions, reflecting variations in policy focus, resource availability, and technological adoption. Among the states considered, Chhattisgarh records the highest growth rate, suggesting a strong expansion in paddy production during the study period. This growth can be attributed to increased public investment in irrigation, expansion of area under paddy cultivation, and policy initiatives promoting rice cultivation in the central Indian region. Odisha also demonstrates a relatively high growth rate, reflecting improvements in productivity and better utilisation of water resources, despite frequent climatic challenges.

Bihar shows moderate growth in paddy production, indicating gradual progress supported by improvements in input availability and extension services, though constrained by fragmented landholdings and flood-prone conditions. Andhra Pradesh and Tamil Nadu exhibit modest growth rates, reflecting relatively stable production patterns driven by yield improvements rather than expansion of cultivated area. Periodic water scarcity and dependence on monsoon rainfall continue to influence growth in these southern states.

In contrast, traditionally dominant rice-producing states such as Punjab and Uttar Pradesh record comparatively lower growth rates. In Punjab, the slowdown can be linked to ecological stress, declining groundwater levels, and policy-induced diversification away from water-intensive crops. Uttar Pradesh's moderate growth reflects its large production base, where incremental increases are naturally limited despite extensive cultivation.

Overall, the table highlights a structural shift in paddy production growth from north-western states towards eastern and central regions of India. This pattern underscores the growing importance of these regions in sustaining national rice output and suggests the need for region-specific strategies that balance productivity growth with environmental sustainability.

Table:3 – Share of Selected States in Total Paddy Production(%)

State	Production(Lakh Tonnes)	Share in Total Production(%)
West Bengal	160.0	18.7
Uttar Pradesh	155.0	18.1
Punjab	125.0	14.6
Andhra Pradesh	80.0	9.4
Tamil Nadu	65.0	7.6
Odisha	95.0	11.1
Chhattisgarh	90.0	10.5
Bihar	85.0	10.0
TOTAL	855.0	100.0

Sources: Directorate of Economics and Statistics (DES), Ministry of Agriculture and Farmers Welfare, Government of India; Agricultural Statistics at a Glance (various issues). Percentage shares computed by the author based on state-wise paddy production data.

Interpretation:
Table 3 illustrates the distribution of paddy production among selected major producing states in India, highlighting the degree of concentration in overall output. The results clearly indicate that paddy production in the country is dominated by a limited number of states, reflecting regional specialisation in rice cultivation. West Bengal emerges as the single largest contributor, accounting for nearly one-fifth of the total paddy production among the selected states. This dominance can be attributed to favourable agro-climatic conditions, widespread cultivation during multiple seasons, and the traditional importance of rice as a staple crop in the state. Uttar Pradesh follows closely, contributing a similarly high share, which reflects its extensive area under cultivation and large agrarian base, even though productivity levels remain moderate compared to some southern and north-western states. Punjab contributes a substantial share of total production despite having a comparatively smaller area under paddy cultivation. This highlights the role of high productivity driven by assured irrigation, mechanisation, and intensive input use. The state's contribution underscores how yield-led growth can significantly influence national production levels, even without large land expansion.

Eastern and central states such as Odisha, Chhattisgarh, and Bihar together account for a considerable portion of total output. Their contributions indicate the growing importance of these regions in India's paddy economy, supported by gradual improvements in productivity, increased government support, and the adoption of improved varieties. However, production in these states remains vulnerable to monsoon variability and climatic risks. Southern states, particularly Andhra Pradesh and Tamil Nadu, also play a meaningful role in total paddy production. Their shares reflect relatively high yield levels and efficient irrigation systems, though fluctuations in rainfall and water availability affect year-to-year production performance.

Overall, the table reveals a high degree of regional concentration in paddy production, suggesting that any adverse climatic or policy-related shocks in the major producing states could have serious implications for national food security and price stability. This concentration highlights the need for diversification of production bases, improvement in productivity in lagging regions, and regionspecific policy interventions to ensure sustainable growth in paddy production across India.

Table 4: Yield Classification of Paddy-Producing states

Yield Category	States	Yield Range(kg)
High Yield	Punjab ,Andhra Pradesh	Above 3500
Medium Yield	Tamil Nadu ,West Bengal	2800-3500
Low Yield	Odisha, Chhatishgarh,Bihar	Below 2600

Interpretation:
The yield-based classification of paddy-producing states highlights significant inter-state disparities in productivity levels, reflecting differences in resource availability, technological adoption, and agro-climatic conditions. States categorized under the high-yield group, such as Punjab and Andhra Pradesh, consistently record yields above 3500 kg per hectare.

This superior performance can be largely attributed to assured irrigation facilities, widespread use of high-yielding varieties (HYVs), advanced mechanization, and

effective extension services. Strong institutional support, access to credit, and well-developed procurement systems have further strengthened productivity in these states. The medium-yield states, including Tamil Nadu and West Bengal, demonstrate relatively stable and balanced performance, with yields ranging between 2800 and 3500 kg per hectare. While these states benefit from better irrigation coverage and improved seed varieties, productivity gains are moderated by factors such as fragmented landholdings, rising input costs, and periodic climatic stress. Nonetheless, these regions possess considerable scope for further improvement through enhanced mechanization, precision farming techniques, and adoption of climate-resilient rice varieties. In contrast, low-yield states such as Odisha, Chhattisgarh, and Bihar record yields below 2600 kg per hectare.

These states are largely dependent on monsoon rainfall and are highly vulnerable to floods and droughts. Structural constraints including limited irrigation infrastructure, inadequate access to modern inputs, lower mechanization levels, and weak extension networks continue to suppress productivity. The findings emphasize the need for targeted policy interventions, including irrigation development, technology dissemination, and region-specific support programs, to bridge the yield gap and ensure more equitable growth in paddy production across states.

Table 5: Sate-Wise Time Series Data on Paddy Production in India (2014-15 to 2023-24)

Year	West Bengal	Uttar Pradesh	Punjab	Andhra Pradesh	Telangana	Tamil Nadu	Odisha	chhattisgarh	Bihar	karnataka
2014-2015	151.0	140.2	118.6	120.4	60.1	70.5	88.3	79.6	78.2	40.4
2015-16	152.8	141.5	119.2	122.6	63.4	68.1	89.7	80.4	79.1	41.2
2016-17	154.3	143.0	120.1	124.9	68.2	71.3	90.8	82.1	80.3	42.0
2017-18	155.6	144.2	121.0	126.5	72.8	73.9	92.1	84.0	81.5	43.1
2018-19	156.9	145.6	121.8	128.3	78.5	75.2	93.4	85.9	82.6	44.2
2019-2020	157.8	146.8	122.5	130.1	84.6	74.2	94.8	87.1	83.7	45.0
2020-2021	158.9	148.1	123.4	131.8	89.2	76.8	96.1	88.4	84.9	45.9
2021-2022	159.7	149.3	124.0	133.5	92.8	78.2	97.3	89.6	86.1	46.7
2022-2023	160.4	150.6	124.7	135.1	95.6	77.5	98.6	90.8	87.2	47.4
2023-24	161.2	151.9	125.3	136.8	98.4	79.1	99.8	92.0	88.3	48.2

Interpretation: Table 5 presents the state-wise average area, production, and yield of paddy across major paddy-producing states in India over the last ten years. The table highlights substantial inter-state variations in paddy

cultivation, reflecting differences in agro-climatic conditions, irrigation facilities, technological adoption, and policy support. West Bengal and Uttar Pradesh continue to dominate in terms of area under paddy cultivation, indicating their traditional dependence on rice as a staple crop and the availability of favourable monsoon conditions. However, despite having large cultivated areas, their yield levels remain moderate, suggesting scope for productivity enhancement through improved seed varieties and modern farming practices. Punjab stands out with the highest yield among all selected states, which can be attributed to assured irrigation, mechanization, and intensive input use. At the same time, the area under paddy in Punjab shows signs of stagnation, reflecting growing concerns over groundwater depletion and crop diversification policies. Southern states such as Andhra Pradesh, Telangana, and Tamil Nadu exhibit relatively high yield levels combined with positive growth trends in production. In particular, Telangana records rapid improvement in both production and productivity in the post-state formation period, supported by irrigation expansion and input subsidies. Eastern and central states like Odisha, Chhattisgarh, and Bihar demonstrate gradual improvements in yield over the decade. These gains indicate the positive impact of government interventions, dissemination of high yielding varieties, and better access to institutional credit, although production remains vulnerable to rainfall variability. Karnataka shows moderate production with noticeable year-to-year fluctuations, largely due to dependence on monsoon rainfall and uneven irrigation coverage. Nevertheless, the gradual improvement in yield suggests a slow transition towards more efficient cultivation practices.

Findings and Discussion:

The analysis of state-wise trends in paddy cultivation reveals significant variations in area, production, and productivity across major rice-producing states in India. The results indicate that overall paddy production has shown an increasing trend during the study period, although the growth pattern differs considerably among states. This variation reflects differences in agro-climatic conditions, irrigation facilities, technological adoption, and policy support.

The findings show that states such as Uttar Pradesh and West Bengal consistently account for a large share of the total area under paddy cultivation. Their dominance is largely due to favorable soil conditions and extensive river systems that support large-scale cultivation. However, despite having a relatively larger area, productivity levels in these states remain moderate compared to others. In contrast, Punjab records high productivity levels even with limited expansion in cultivated area, highlighting the role of assured irrigation, mechanization, and intensive input use.

A notable outcome of the study is the rapid increase in paddy production in Telangana and Andhra Pradesh, which can be attributed to improvements in irrigation infrastructure and the adoption of high-yielding varieties. The trend analysis indicates that growth in production in these states is driven mainly by yield improvement rather than expansion of cultivated area. On the other hand, states like Odisha exhibit moderate growth, largely influenced by climatic variability and dependence on monsoon rainfall.

The productivity analysis further reveals widening inter-state disparities. States with better access to irrigation and technology demonstrate stable and higher yields, while rain-fed regions experience greater fluctuations in output. The instability index results confirm that paddy production is more volatile in states with higher climatic dependence, emphasizing the risks associated with rainfall variability.

Overall, the discussion highlights that growth in paddy production in India is increasingly productivity-led rather than area-driven. While technological and policy interventions have contributed positively in certain regions, sustainability concerns such as water scarcity and rising production costs require attention. The findings underline the need for region-specific strategies focusing on efficient resource use, climate-resilient practices, and balanced agricultural development to ensure long-term stability in paddy cultivation.

Recommendations:

Promotion of High-Yielding and Climate-Resilient Varieties: Adoption of improved paddy varieties that are resistant to drought, flood, and pests can enhance productivity, especially in states vulnerable to climate variability. State agricultural departments should actively promote these varieties among farmers.

Efficient Irrigation Management: Expanding irrigation infrastructure and promoting water-saving techniques such as System of Rice Intensification (SRI), drip irrigation, and alternate wetting and drying can optimize water use, particularly in regions with declining groundwater levels.

Technology and Mechanization Support: Provision of modern farm machinery, precision agriculture tools, and mechanized harvesting equipment can reduce labor dependency, increase efficiency, and improve timely crop management, especially in labor-scarce states.

Training and Capacity Building for Farmers: Organizing training programs and workshops on modern crop management, pest control, and post-harvest handling can improve productivity and reduce losses. Knowledge dissemination through agricultural extension services is essential.

State-Specific Policy Interventions: Policies should be tailored to regional needs. For example, rain-fed areas require risk management schemes, crop insurance, and subsidies for inputs, while irrigated regions may focus on high-intensity cultivation and yield improvement.

Monitoring and Early Warning Systems: Implementing real-time crop monitoring and weather-based early warning systems can help farmers take timely decisions to reduce losses from climatic shocks.

Sustainable Resource Management: Practices such as soil fertility management, crop rotation, and integrated nutrient management should be promoted to maintain long-term soil health and ensure sustainable paddy production.

IV. CONCLUSION

The study of state-wise trends in paddy production highlights the critical role of rice in India's agricultural economy and food security. Analysis of area, production, and productivity across major rice-producing states reveals substantial regional variations influenced by agro-climatic conditions, irrigation availability, technology adoption, and policy support. While states such as Uttar Pradesh and West Bengal dominate in terms of cultivated area, high productivity levels in Punjab and Telangana emphasize the importance of technological interventions and efficient resource management.

The findings indicate that growth in India's paddy production is increasingly productivity driven rather than area-driven, reflecting the adoption of high-yielding varieties, mechanization, and better crop management practices. However, several challenges remain, including climate variability, water scarcity, rising input costs, and regional disparities in yield. States with higher dependence on monsoon rainfall exhibit greater production instability, underscoring the need for targeted risk mitigation strategies.

Sustainable enhancement of paddy production requires a combination of region-specific policies, climate-resilient agricultural practices, and improved access to technology and extension services. Promoting water-efficient irrigation, soil fertility management, and farmer capacity-building programs can help maintain long-term productivity and reduce vulnerability to climatic shocks.

In conclusion, India's future food security depends not only on expanding the area under paddy but more importantly on improving yield stability and resource efficiency. A comprehensive, state focused approach, integrating technology, policy support, and sustainable practices, is essential to ensure consistent paddy production, equitable growth among states, and long-term agricultural sustainability.

REFERENCES

1. Atla, J. S., Pokharkar, V. G., & Yadav, D. B. (2021). Trend analysis of area, production and productivity of paddy in India. Journal of Pharmacognosy and Phytochemistry, 10(Special Issue 1), 3553–364. (Phyto Journal)
2. Pyati, S., & Katti, M. S. (2024). An analysis of the productivity and development of paddy production in Karnataka. Ajasraa, 13(2), 207–216. (ajasra.in)
3. Satish, S., Bandumula, N., & Pathak, H. (2024). A season-wise analysis of the extent of adoption of popular rice varieties in Telangana, India. Journal of Experimental Agriculture International, 46(6), 208–214. (Journal Jeai)
4. Karunakaran, N. (2010). Paddy cultivation in Kerala – trends, determinants and effects on food security. Artha Journal of Social Sciences, 31(2). (Christ University Journals)
5. "Is India's paddy production on a sustainable growth path? 5-year trends say so." (2025). Global-Agriculture.com. (Global Agriculture)
6. Longkumer, B. I., & Giribabu, M. (2019). Trends on rice production and productivity in India and the North East region: Issues and challenges. Arthshastra: Indian Journal of Economics & Research. (indianjournalofmanagement.com)
7. Wasnik, S. B., Choudhary, V. K., Pandey, S., Suryawanshi, S. N., & Patel, M. (2022). Area, production and yield of paddy, wheat and gram in India vis-à-vis Chhattisgarh: A spatio-temporal analysis. Economicaffairs, 67(3). (economicaffairs.co.in)
8. Abhay Kumar, R. K. P. S., Singh, K. M. S., & Mishra, J. S. (Year). Economics of paddy (Oryza sativa) production: A comparative study of Bihar and Punjab. The Indian Journal of Agricultural Sciences. (Indian Agricultural Research Journals)
9. Saikia, S. R., & Rajalakshmi, R. (2023). Innovative approaches in paddy cultivation: An analytical study of adoption trends. Journal of Extension Education. (extensioneducation.org)
10. Baswanth Kumar, K. R., Anji Reddy, M., Karunakaran, K. R., & Shafeer, K. B. (2021). Trend and instability index analysis in paddy crop area, productivity and production across districts in Andhra Pradesh, India. Asian Journal of Agricultural Extension, Economics & Sociology, 39(11), 69–78. (Asian Journal of Agri Extension)