Economic Affairs, Vol. **70**(01), pp. 97-105, March 2025
DOI: 10.46852/0424-2513.1.2025.13

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RESEARCH PAPER

Trends in the Acreage, Yield and Output of Key Crops in Jammu and Kashmir

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Received: 17-12-2024 **Revised:** 25-02-2025 **Accepted:** 10-03-2025

ABSTRACT

The agriculture sector in Jammu and Kashmir plays a vital role in the region's economy and livelihoods, with a diverse crop portfolio that includes staples like rice, wheat and pulses as well as high-value crops such as fruits and vegetables. This study analyzed trends in acreage, production and yield of key crops from 2013 to 2023, revealing significant shifts influenced by climate change, market dynamics and policy interventions. Rice and wheat cultivation exhibited stagnation in productivity with minimal changes in acreage but declining production and yield. Coarse cereals and vegetables showed positive trends in production and yield, reflecting improved farming practices. In contrast, pulses and oil seeds experienced consistent declines in area and yield, highlighting challenges in sustaining these crops. The findings emphasize the need for targeted interventions to enhance productivity, stabilize yields, and address variability in farming outcomes, ensuring sustainable agricultural development in Jammu and Kashmir.

HIGHLIGHTS

- Stagnation or decline in rice, pulses, and oil seeds production calls for immediate attention to enhance efficiency and profitability.
- Stagnation or decline in rice, pulses, and oil seeds production calls for immediate attention to enhance efficiency and profitability.
- Focused interventions are needed to promote sustainable farming practices, improve resource use, and support farmers through technological and financial assistance.

Keywords: Agriculture sector, production, Jammu and Kashmir and yield

The agriculture sector in Jammu and Kashmir is a critical component of the region's economy and livelihoods, supporting a large portion of its population. This unique region, marked by diverse topography and climate, cultivates a variety of crops that range from staples like rice, wheat, pulses and course cearels to high-value horticultural products and vegetables. Over recent decades, trends in crop acreage, yield, and output have undergone significant changes, influenced by factors such as climate change, evolving market demands, advancements in agricultural technology, and government interventions aimed at boosting productivity and income for farmers. Analyzing these trends offers valuable insights into the shifting dynamics of Jammu and Kashmir's agricultural landscape. The changes in acreage reflect farmers' choices in response to economic incentives, crop adaptability, and climatic conditions. Yield trends reveal the region's progress in productivity per unit area, influenced by improved practices, access to quality seeds, and soil health. Output trends, which combine acreage and yield, indicate the total production levels and help assess food security, export potential, and

How to cite this article: Goswami, K.B. (2025). Trends in the Acreage, Yield and Output of Key Crops in Jammu and Kashmir. *Econ. Aff.*, **70**(01): 97-105.

Source of Support: None; **Conflict of Interest:** None

economic growth. Understanding these trends is crucial for policymakers, agricultural experts, and stakeholders, as it provides a basis for enhancing crop production sustainably. By recognizing the specific challenges and opportunities, initiatives can be implemented to support farmers, ensure food security, and contribute to the long-term development of agriculture in Jammu and Kashmir.

OBJECTIVES OF THE STUDY

1. To analyze trends in the acreage, yield, and output of key crops in Jammu and Kashmir over the past decade.
2. To identify the factors influencing changes in acreage, yield and output of these crops.

MATERIALS AND METHODS

The study was based on secondary data collected from 2013-14 to 2022-23 from the relevant official records from the Handbook of Statistics on Indian States, Reserve Bank of India, 2022-23. The compound growth rate (C.G.R) was used to compute the growth of area, production and yield of major crops. For computing C.G.R, regression analysis was applied by the following formula:

$$Y = \alpha (\beta)^t$$

Where,

Y = Dependent, α = Constant, $\beta = 1 + r$, r = Compound Growth Rate and t = Time Variable in Years (2013-14 to 2022-23)

Now,

$$Log\ Y = Log\ \alpha + t\ Log\ (1 + r)$$

OR

$$Y^* = a + bt$$

Where,

$$Y^* = Log\ Y,\ a = Log\ \alpha \text{ and } b = Log\ (1 + r)$$

Now,

$(1 + r) = Antilog\ b$

$r = Antilog\ b - 1$

In percentage term $r = [Antilog\ b - 1] \times 100$

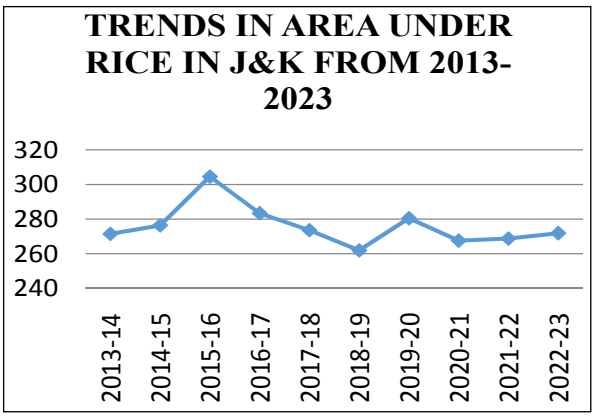
The formula for calculating the co-efficient of variation is as follows:

$$C\ V = (SD/Mean) \times 100$$

Where SD = Standard deviation

RESULTS AND DISCUSSION

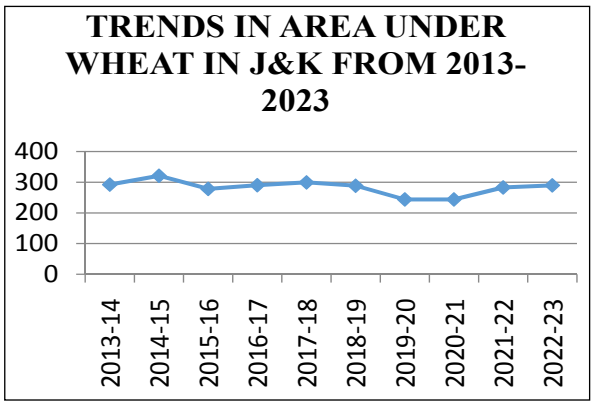
Trends in Area under Rice, Wheat, Course Cereals, Pulses, Oil Seeds, Fruits and Vegetables in J&K



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 1: Trends in Area under Rice in J&K from 2013-2023

The area under rice cultivation in Jammu and Kashmir experienced fluctuations over the years. The area increased by 1.8% from 2013-14 to 2014-15, followed by a significant rise of 10.2% in 2015-16, the highest during the period. However, there was a sharp decline of 6.9% in 2016-17 and a further decrease of 3.5% in 2017-18. The downward trend continued with a 4.2% drop in 2018-19, the lowest point.

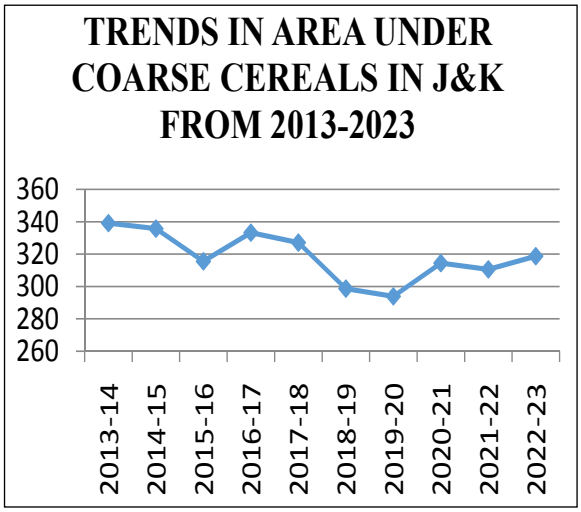


Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 2: Trends in Area under Wheat in j&k from 2013-2023

After a slight recovery in 2019-20, the area decreased again in 2020-21 but gradually stabilized with minor increases of 0.4% in 2021-22 and 1.2% in 2022-23. Overall, the area in 2022-23 shows a marginal decline of 0.2% compared to 2013-14.

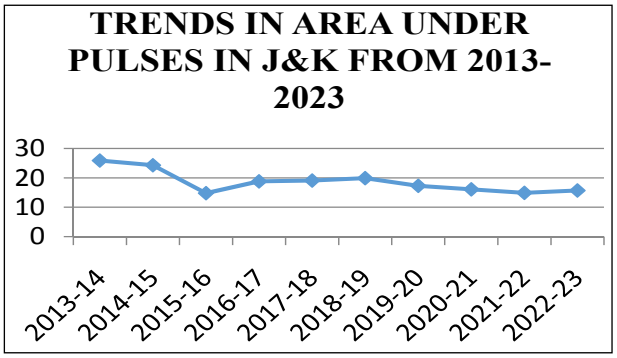
The area under wheat cultivation in Jammu and Kashmir experienced varying growth rates. Between 2013-14 and 2014-15, the area rose by 9.9% to a peak of 321.0 thousand hectares. However, this was followed by a severe 13.4% drop in 2015-16. After slight changes, the area fell to a low of 243.8 thousand hectares in 2020-21, representing a 16.5% reduction from its peak in 2014-15. The recovery trend began in 2021-22, with the area increasing by 16.0% over two years to 289.7 thousand hectares in 2022-23. Despite recent advances, the total area under wheat production has dropped by about 0.8% over the past ten years.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 3: Trends in Area under Coarse Cereals in J&K from 2013-2023

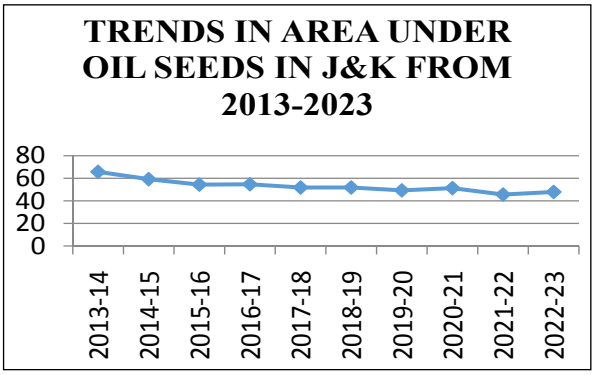
The area under coarse cereals in Jammu and Kashmir fluctuated between 2013 and 2023. Starting at 339.1 thousand hectares in 2013-14, the area fell by 1.0% in 2014-15 and even more by 6.0% in 2015-16. A small recovery of 5.6% occurred in 2016-17, followed by steady reductions, with a low of 293.9 thousand hectares in 2019-20, a 13.3% drop from 2013-14. The area increased to 318.7 thousand hectares in 2022-23, representing an 8.4% increase from its lowest point, following a moderate recovery in 2020-21. Overall the area under coarse cereals declined by around 6.0% over the decade.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23*

Fig. 4: Trends in Area under Pulses in J&K from 2013-2023

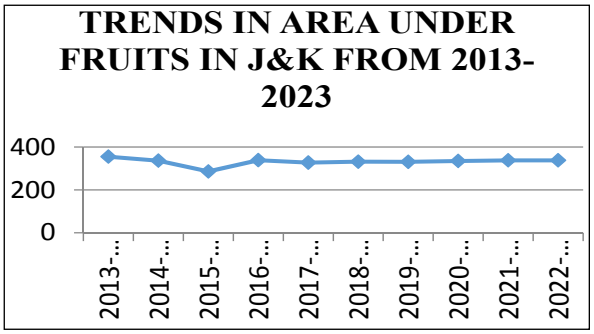
The area under pulses in Jammu and Kashmir has been falling, with large changes from 2013 to 2023. From 2013-14 to 2014-15, the area decreased by 6.2%, followed by a 39.1% drop to 14.8 thousand hectares in 2015-16, the decade's low point. A modest recovery ensued, peaking at 19.9 thousand hectares in 2018-19 before gradually dropping back to 15.7 thousand hectares in 2022-23. Over a decade, the area under pulses declined by 39.4%, indicating a considerable shift away from pulse cultivation.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 5: Trends in Area under Oil seeds in J&K from 2013-2023

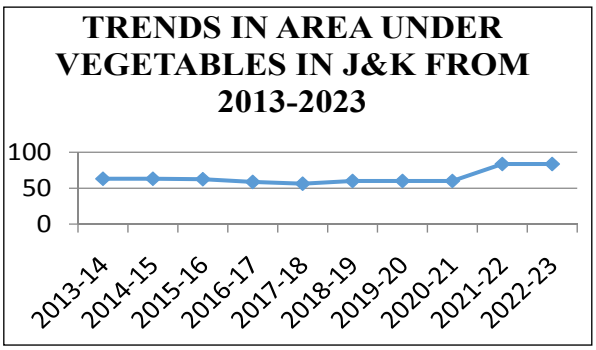
The area planted to oil seeds in Jammu and Kashmir decreased gradually between 2013 and 2023, with only slight changes. The area decreased significantly, from 65.7 thousand hectares in 2013-14 to 59.2 thousand hectares in 2014-15, and then by 8.1% to 54.4 thousand hectares in 2015-16. Continuing on this downward trend, it reached its lowest point in 2021-2022, reaching 45.6 thousand hectares, a 30.6% drop from 2013-2014. The area expanded by 5.1% to 47.9 thousand hectares in 2022-2023, indicating a slight recovery. The overall area under oil seeds has fallen by 27.1% in the last ten years.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 6: Trends in Area under Fruits in J&K from 2013-2023

The area under fruit farming in Jammu and Kashmir fluctuated between 2013 and 2023, with an initial decline followed by stabilization in recent years. Starting at 355.2 thousand hectares in 2013-14, the area fell significantly by 5.3% to 336.5 thousand hectares in 2014-15, then further 14.9% to 286.2 thousand hectares in 2015-16. A recovery began in 2016-17, with the area increasing by 18.4% to 338.8 thousand hectares and then stabilizing at 330-338 thousand hectares until 2022-23. By the conclusion of the decade, the area had decreased by 4.9% from 2013-14, to 337.9 thousand hectares.

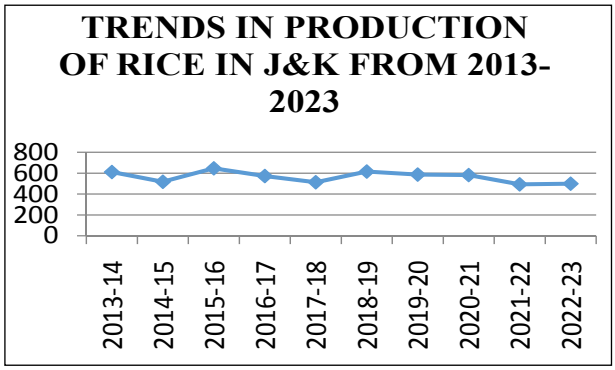


Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 7: Trends in Area under Vegetables in J&K from 2013-2023

From 2013 to 2023, the total area under vegetable cultivation in Jammu & Kashmir grew, with the latter years seeing a notable increase. From its original value of 63.1 thousand hectares in 2013–14, the area stayed constant until 2014–15, but then decreased marginally to 62.6 thousand hectares in 2015–16 and then to 56.3 thousand hectares in 2017–18, representing a 10.8% loss. The region stabilized at 60.1 thousand hectares till 2020–21 after the recovery started in 2018–19. The area grew by 39.3% to 83.7 thousand hectares in 2021–2022, a significant increase that continued into 2022–2023. The area planted to vegetables grew by 32.7% during the course of the decade.

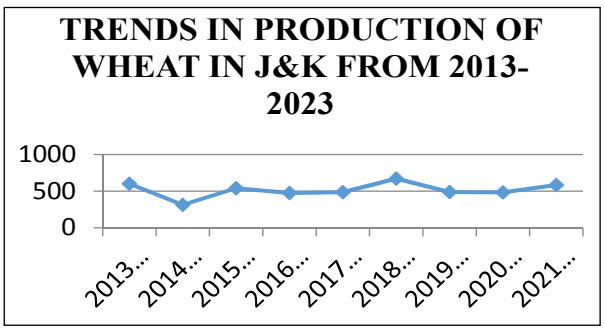
Trends in Production under Rice, Wheat, Course Cereals, Pulses, Oil Seeds, Fruits and Vegetables in J&K



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 8: Trends in Production of Rice in J&K from 2013-2023

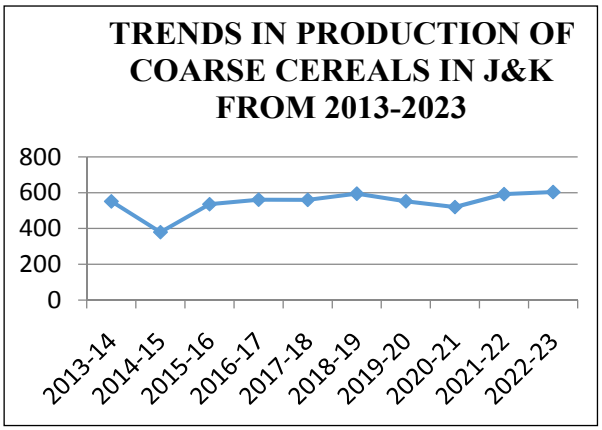
Rice output in Jammu and Kashmir fluctuated from 2013 to 2023, reflecting changes in meteorological, agronomic, and managerial factors. Production fell 15.4% to 517.2 thousand metric tons in 2014-15 after peaking at 610.9 thousand metric tons in 2013-14. This was followed by a considerable resurgence in 2015-16, with production reaching 646.4 thousand metric tons, up 25.0% from the previous year. However, a slow decline began, with production dropping to 513.1 thousand metric tons in 2017-18, a 20.6% decrease from the high. A temporary recovery occurred in 2018-19, with production climbing to 615.8 thousand metric tons, but successive years exhibited a declining trend, reaching the decade's low of 492.9 thousand metric tonnes in 2021-22. Despite a minor recovery to 498.7 thousand metric tons in 2022-23, rice production fell by 18.4% throughout the decade.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 9: Trends in Production of Wheat in J&K from 2013-2023

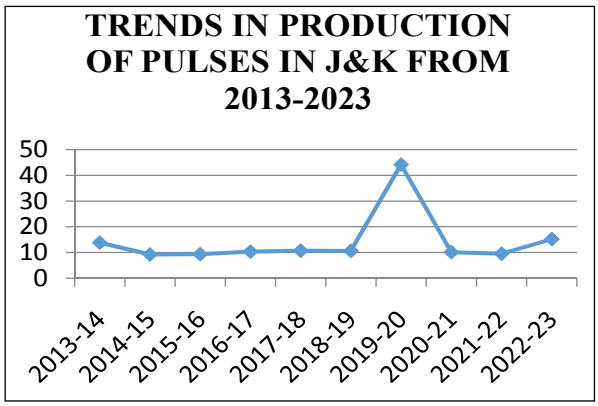
Jammu & Kashmir's wheat production increased erratically between 2013 and 2023. Production increased by 72.3% in 2015–16 and 24.1% in 2018–19 following a 47.8% decrease in 2014–15. There was a 27.3% decline in 2019–20 and a little 0.9% decline in 2020–21. Nonetheless, output bounced back, increasing by 20.7% in 2021–2022 and by a moderate 2.5% in 2022–2023, reaching a stable level of 598.8 thousand tonnes.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 10: Trends in Production of Coarse Cereals in J&K from 2013-2023

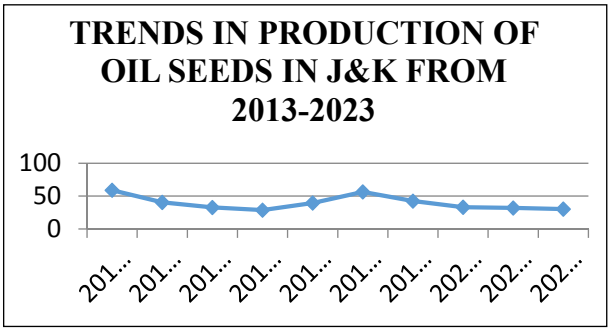
Jammu & Kashmir's production of coarse cereals fluctuated between 2013 and 2023. In 2014–15, production fell 31.3%, but in 2015–16, it again increased 41.1%. It increased by 6.3% in 2018–19 while remaining steady with only little variations. Despite a 7.3% decline in 2019–20, production increased by 7.7% in 2021–22 and by 2.0% in 2022–23.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 11: Trends in Production of Pulses in J&K from 2013-2023

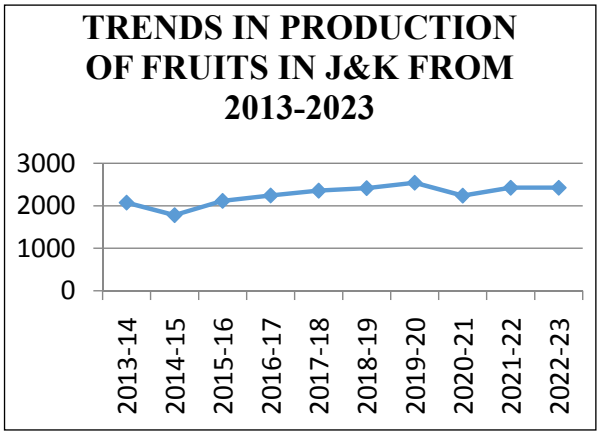
There was notable unpredictability in Jammu & Kashmir's pulse production between 2013 and 2023. Production began at 13.8 thousand tonnes in 2013–14 and fell 33.3% to 9.2 thousand tonnes in 2014–15. It increased somewhat but still low, reaching 10.7 thousand tonnes in 2017–18. In 2019–20, production increased by 317.9% to 44.2 thousand tonnes, marking a noteworthy peak. Production, however, dropped once more to 10.1 thousand tonnes in 2020–21 and stayed low at 9.5 thousand tons in 2021–2022. In 2022–2023, production increased by 59.5% to 15.2 thousand tons, marking a modest recovery.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 12: Trends in Production of Oil Seeds in J&K from 2013-2023

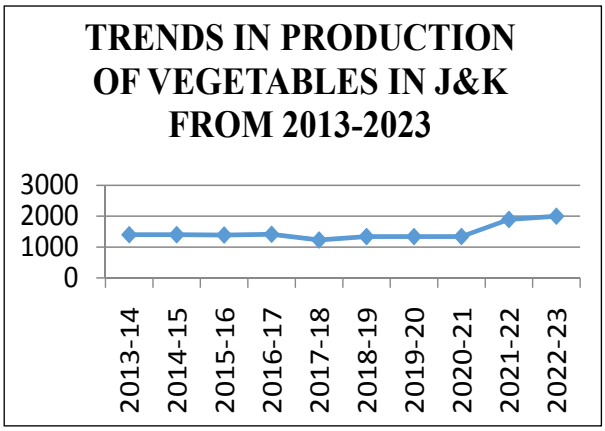
Jammu & Kashmir's oilseed output decreased between 2013 and 2023. Production fell by 31.3% from 58.8 thousand tonnes in 2013–14 to 40.4 thousand tonnes in 2014–15, and then fell further, to a low of 28.6 thousand tonnes in 2016–17. Production increased to 39.4 thousand tonnes in 2017–18 after a 37.4% recovery, reaching a peak of 56.3 thousand tonnes in 2018–19. Production, however, fell by 24.9% in 2019–20 and then by 28.6% in 2022–2023 to reach 30.2 thousand tons final.



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 13: Trends in Production of Fruits in J&K from 2013-2023

Fruit production in Jammu & Kashmir showed fluctuations from 2013 to 2023. After a 14.2% decline in 2014-15, it rebounded by 19.0% in 2015-16, reaching 2115.7 thousand tonnes. The upward trend continued, peaking at 2541.2 thousand tonnes in 2019-20. However, production decreased by 12.0% in 2020-21 to 2237.9 thousand tonnes but stabilized at 2424.6 thousand tonnes in 2021-23, showing overall growth with minor fluctuations.

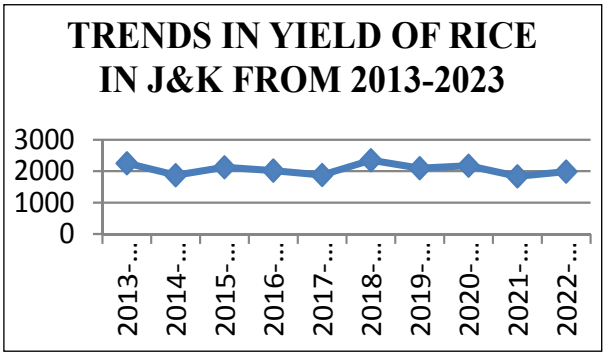


Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 14: Trends in Production of Vegetables in J&K from 2013-2023

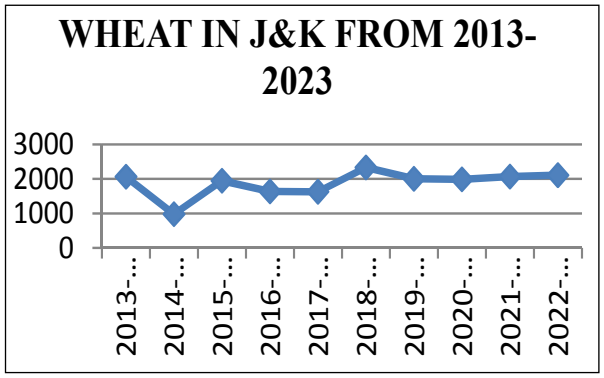
Vegetable production in Jammu & Kashmir fluctuated from 2013 to 2023. After starting at 1395.5 thousand tonnes in 2013-14, it dropped slightly in 2015-16 and 2017-18, reaching a low of 1226.0 thousand tonnes. However, production rebounded in 2018-19, remained stable through 2020-21, and surged by 41.6% to 1995.3 thousand tonnes in 2022-23.

Trends in Yield under Rice, Wheat, Course Cereals, Pulses, Oil Seeds, Fruits and Vegetables in J&K



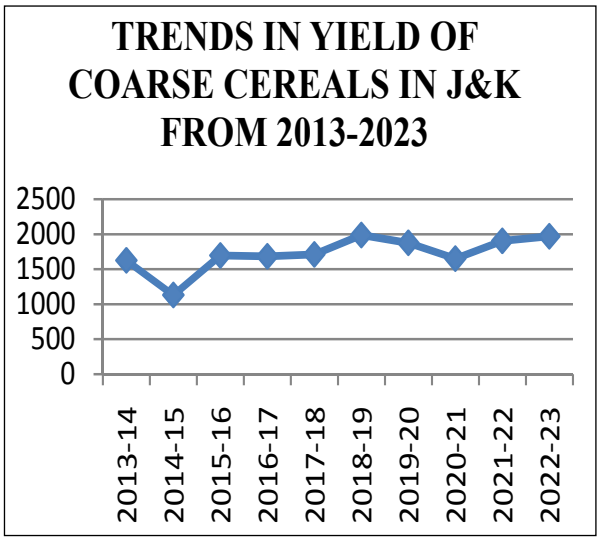
Source: *Handbook of Statistics on Indian States, RBI, 2022-23*

Fig. 15: Trends in Yield of Rice in J&K from 2013-2023



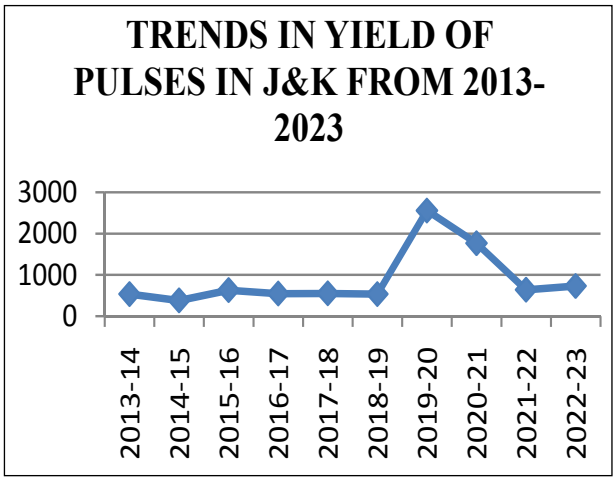
Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 16: Trends in Yield of Wheat in J&K from 2013-2023



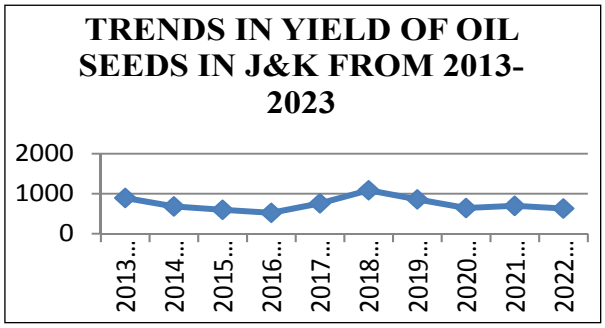
Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 17: Trends in Yield of Coarse Cereals in J&K from 2013-2023



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 18: Trends in Yield of Pulses in J&K from 2013-2023



Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Fig. 19: Trends in Yield of Oil Seeds in J&K from 2013-2023

The yield trends of key crops in Jammu & Kashmir from 2013 to 2023 show significant fluctuations influenced by various factors. For oil seeds, the yield declined sharply from 895 kg/ha in 2013-14 to 523 kg/ha in 2016-17 but recovered in 2017-18, peaking at 1086 kg/ha in 2018-19 before experiencing some decline in the following years. Course cereals followed a similar pattern, with a dip in 2014-15 but rising steadily after 2015-16, reaching the highest yield of 1989 kg/ha in 2018-19. Pulses showed a dramatic rise in 2019-20, reaching an all-time high of 2559 kg/ha, though the yield dropped again in the following years. Wheat yields were volatile, with a sharp decline in 2014-15 but a recovery thereafter, peaking in 2018-19 at 2330 kg/ha, before stabilizing in the subsequent years. Rice, the most important crop, followed a similar trajectory, with a peak of 2350 kg/ha in 2018-19, followed by a decline in 2021-22 to the lowest yield of 1834 kg/ha, before slightly recovering in 2022-23. Overall, the yields of most crops were affected by a combination of factors, including weather conditions, farming practices, and market dynamics, leading to varying trends across the decade. The most notable period of high yields was 2018-19, with fluctuations in the following years reflecting the challenges faced by the agricultural sector in the region.

Trends of Area, Production, and Yield of Rice, Wheat, Coarse Cereals, Pulses and Oil Seeds crops in Jammu & Kashmir

The rice cultivation area in Jammu & Kashmir has shown minimal change, with a compound growth rate (C.G.R) of 0.0002%, reflecting stability in land use. However, both rice production and yield have experienced declines, with C.G.R values of -2.23% and -1.38% respectively.

Table 1: Growth of area, production and productivity of rice crop (2013-2023)

Statistical tools	Area	Production	Yield
Mean	276.02	563.57	2057.50
C.V	4.26	9.65	8.35
C.G.R	0.0002	-2.23	-1.38

Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

This suggests that despite consistent land under cultivation, factors other than the area may have been affecting productivity. The moderate variation in area, production, and yield (C.V values of 4.26%, 9.65%, and 8.35%, respectively) highlights fluctuations but underscores the overall trend of decreasing efficiency in rice farming.

Table 2: Growth of area, production and productivity of Wheat crop (2013-2023)

Statistical tools	Area	Production	Yield
Mean	282.95	524.78	1874.30
C.V	8.34	18.84	20.16
C.G.R	-0.0009	-0.06	0.25

Source: *Handbook of Statistics on Indian States, RBI, 2022-23*

Wheat cultivation in Jammu & Kashmir has shown a slight decline in area, with a compound growth rate (C.G.R) of -0.0009%, indicating stable but slightly decreasing land use for wheat farming. Despite this, wheat production has remained almost constant, with a minimal negative growth rate of -0.06%. However, the yield has shown a slight positive growth of 0.25%, indicating a small improvement in productivity per hectare. The high coefficients of variation (C.V) for production (18.84%) and yield (20.16%) suggest significant fluctuations in wheat production and yield.

Table 3: Growth of area, production and productivity of coarse cereals crop (2013-2023)

Statistical tools	Area	Production	Yield
Mean	318.69	544.78	1724.40
C.V	4.78	11.72	14.42
C.G.R	-0.006	1.01	2.16

Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

The cultivation of coarse cereals in Jammu & Kashmir has seen a slight decrease in area, with a compound growth rate (C.G.R) of -0.006%, indicating a marginal reduction in land allocated

to these crops. However, the production of coarse cereals has shown a positive growth rate of 1.01%, reflecting an increase in total output. Additionally, the yield has improved by 2.16% annually, suggesting better productivity per hectare over time. The coefficients of variation (C.V) for area (4.78%), production (11.72%), and yield (14.42%) indicate moderate fluctuations.

Table 4: Growth of area, production and productivity of pulses crop (2013-2023)

Statistical tools	Area	Production	Yield
Mean	18.68	14.29	887.90
C.V	20.52	74.84	79.23
C.G.R	-0.05	0.01	0.04

Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Pulses cultivation in Jammu & Kashmir has experienced a slight decline in area, with a compound growth rate (C.G.R) of -0.05%, indicating a small reduction in the land dedicated to pulses farming. Despite this, production has remained relatively stable, with a positive growth rate of 0.01%, showing little change in total output. Yield, however, has increased slightly by 0.04% annually, reflecting marginal improvements in productivity per hectare. The very high coefficients of variation (C.V) for area (20.52%), production (74.84%), and yield (79.23%) indicate significant fluctuations, suggesting that pulses farming is highly variable.

Table 5: Growth of area, production and productivity of oil seeds crop (2013-2023)

Statistical tools	Area	Production	Yield
Mean	53.17	39.34	737.40
C.V	10.94	27.02	22.68
C.G.R	-0.03	-0.07	-0.04

Source: *Handbook of Statistics on Indian States, RBI, 2022-23.*

Oil seeds in Jammu & Kashmir exhibited a mean area of 53.17 thousand hectares, production of 39.34 thousand tonnes, and yield of 737.40 kg/hectare. The area showed lower variability (C.V. 10.94%) compared to production (27.02%) and yield (22.68%), indicating fluctuating productivity. The negative compound growth rates (C.G.R.) for area (-0.03%), production (-0.07%), and yield (-0.04%) reflect a declining trend, emphasizing the need for technological interventions and enhanced farming practices to boost sustainability and output

The dynamics of land use, crop yields, and agricultural output in Jammu and Kashmir are determined by a complex interplay of environmental, economic, and policy factors. Variability in climate, characterized by shifts in rainfall patterns, temperature changes, and extreme weather events, significantly affects crop development and productivity. The health of the soil has deteriorated due to practices such as over-cultivation and erosion, while insufficient irrigation infrastructure and a heavy reliance on rainfall limit water availability, particularly during dry periods. Economic considerations are vital, as fluctuating market prices and profitability encourage farmers to allocate land to high-value crops, such as fruits and vegetables, rather than traditional staples like pulses and oilseeds. While advancements in technology, including high-yield seed varieties and modern agricultural machinery, have led to increased productivity for some crops, their inconsistent adoption has resulted in disparities among farmers. Government policies, including subsidies, minimum support prices (MSP), and crop insurance schemes, play a significant role in shaping cropping patterns and investment decisions, while challenges such as pest outbreaks and crop diseases.

CONCLUSION

The analysis of trends in the acreage, production, and yield of key crops in Jammu and Kashmir over the past decade reveals a dynamic agricultural landscape Rice cultivation showed minimal changes in acreage, with a compound growth rate (C.G.R) of 0.0002%, but experienced declines in both production (-2.23%) and yield (-1.38%), indicating stagnation in efficiency. Wheat displayed a slight decline in area (-0.0009%) and negligible change in production (-0.06%), while yield improved marginally (0.25%), reflecting modest productivity gains despite fluctuations. Coarse cereals exhibited a slight decline in acreage (-0.006%) but saw positive growth in production (1.01%) and yield (2.16%), suggesting better utilization of existing land resources. Pulses experienced a sharp decline in acreage (-0.05%) but maintained stable production (0.01%) with slight improvements in yield (0.04%), although high variability highlighted inconsistencies in farming outcomes. Oilseeds showed a consistent decline across area (-0.03%), production (-0.07%),

and yield (-0.04%), underscoring the need for targeted interventions to reverse the trend.

Overall, the findings indicate significant fluctuations and varying growth patterns across different crops, emphasizing the need for policy support to stabilize and enhance agricultural performance. The decline in critical crops such as rice and oilseeds suggests challenges like climate vulnerability, suboptimal practices, and market constraints, while the modest improvements in yield for crops like wheat and coarse cereals point to the potential benefits of technological and managerial advancements. Enhancing agricultural sustainability in Jammu and Kashmir requires strategic interventions, including improved seed quality, irrigation infrastructure, market access, and extension services, to optimize productivity and support the livelihoods of farmers in the region.

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