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Statistical Analysis of the Arrivals of Major Crops at Hingoli Agricultural Produce Market Committee: A Study of 2021 to 2026

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Abstract

The present study examines the arrivals of major crops recorded at the Hingoli Agricultural Produce Market Committee (APMC) during the five agricultural years from 2021–22 to 2025–26. The study uses the available annual records of arrivals and market prices of the Hingoli APMC as a secondary source of data. In the system of the Maharashtra State Agricultural Marketing Board, market committees upload daily information on agricultural commodity arrivals and prices, including arrivals, minimum price, maximum price, and modal (general) price.

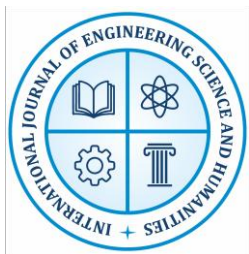
To analyse arrivals, the study employs statistical methods such as mean, standard deviation (SD), coefficient of variation (CV), year-on-year percentage change, linear trend, R^2 , and, where appropriate, Pearson correlation. The analysis indicates that turmeric/turmeric rhizomes (turmeric produce) and soybean recorded comparatively large volumes of arrivals. Turmeric arrivals increased from 176,282 quintals in 2021–22 to 319,519 quintals in 2025–26, representing an increase of 81.25% over the initial year.

The linear trend in turmeric arrivals is positive, with $R^2 = 0.829$. The Pearson correlation coefficient between turmeric arrivals and the modal market price is +0.805. However, this correlation does not establish a cause-and-effect relationship. Further, arrivals recorded at an APMC represent the quantity of agricultural produce actually recorded in that market; they cannot be equated with the total agricultural production of Hingoli district. Turmeric/turmeric rhizomes are brought to the Hingoli APMC not only from Hingoli district but also from neighbouring areas.

Keywords: Agricultural Market, Agricultural Produce Market Committee, Market Arrivals, Turmeric, Turmeric Rhizomes, Soybean, Hingoli, Trend Analysis, CV, SD, Linear Trend.

1. Introduction

Indian agriculture gives considerable importance not only to agricultural production but also to the marketing of agricultural produce. Agricultural Produce Market Committees play an



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important role in providing farmers with appropriate markets for their produce, streamlining the process of sale, ensuring transparency in market transactions, and making market-price information available. (Maharashtra State Agricultural Marketing Board [MSAMB], 2026).

In Maharashtra, the Agricultural Produce Market Committee (APMC) system operates for the regulation of agricultural produce markets. According to the Maharashtra State Agricultural Marketing Board, the functioning of APMCs is related to the regulation of agricultural produce markets. (MSAMB, 2026).

The arrivals of agricultural produce recorded in a market are an important indicator of the economic and agricultural transactions of that market. Therefore, changes in crop arrivals over a specific period—such as which crops increase or decrease, which remain relatively stable, and which show greater fluctuations—help in understanding the characteristics of the concerned agricultural market and the cropping pattern reflected in that market. Hence, their study is useful for understanding the nature of an agricultural market. (MSAMB, 2026).

1.2 Research Area –

Present study focuses on the Hingoli Agricultural Produce Market Committee, the majority of crops arrivals originate from within the district.

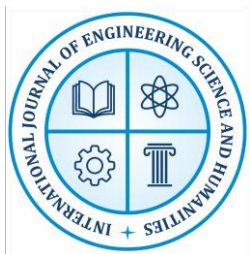
Hingoli is situated at the northern part of Marathwada in Maharashtra. It is the administrative headquarters of the district. The districts cover 4,526 sq.km. area including 5 tehsils. The district is known as Turmeric Capital of India.

2. Background of the Study

Hingoli is an important agricultural district in the Marathwada region, and various crops contribute to its agricultural economy. The Hingoli District Administration website gives turmeric a special place in the district's agricultural and market identity. In view of the significant turmeric production in the district in recent years, Hingoli has acquired a new identity as the "Turmeric Capital of India." The district administration has stated that Wasmat Turmeric received a Geographical Indication (GI) recognition on 30 March 2024. (Hingoli District Administration, 2026).

Various crops arrive at the Hingoli Agricultural Produce Market Committee, including turmeric/turmeric rhizomes, soybean, chickpea, pigeon pea, wheat, sorghum, groundnut, and others. (Hingoli Agricultural Produce Market Committee [Hingoli APMC], 2021–22–2025–26).

In agricultural marketing studies, the relationship between market arrivals and prices, marketable/marketed surplus, price behaviour, and the role of Agricultural Produce Market Committees are important components. The agricultural marketing curriculum under the Indian Council of Agricultural Research (ICAR) Sixth Deans' Committee also includes the study of the relationship between market arrivals and prices. (ICAR, 2026).



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3. Statement of the Problem

Although large quantities of various crops arrive at the Hingoli Agricultural Produce Market Committee, it is necessary to statistically analyse the changes in these arrivals over time, identify crops showing increasing trends, determine the crops experiencing instability, and understand the market position of an important crop such as turmeric.

Therefore, the present study scientifically and statistically examines the arrivals of major crops at the Hingoli Agricultural Produce Market Committee during the five-year period from 2021–22 to 2025–26.

4. Objectives of the Study

1. To study the year-wise arrivals of major crops at the Hingoli Agricultural Produce Market Committee.
2. To determine the increase or decrease in crop arrivals during the study period.
3. To measure the stability and degree of variation in the arrivals of different crops.
4. To analyse fluctuations in crop arrivals with the help of Standard Deviation (SD) and Coefficient of Variation (CV).
5. To determine the linear trend in the arrivals of major crops.
6. To undertake a separate analysis of turmeric/turmeric rhizome arrivals.
7. To examine the statistical relationship between turmeric arrivals and the modal market price.
8. To clarify the conceptual difference between arrivals at the Hingoli Agricultural Produce Market Committee and total agricultural production in the district.

5. Hypotheses

1. The arrivals of major crops at the Agricultural Produce Market Committee vary from year to year during the study period.
2. Turmeric arrivals at the Agricultural Produce Market Committee show an increasing trend.
3. The stability of arrivals varies among different crops.
4. A statistical relationship exists between turmeric arrivals and the modal market price.

6. Research Methodology

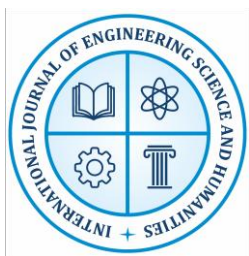
6.1 Type of Research

The present study is descriptive and analytical in nature. (Kothari & Garg, 2019).

6.2 Sources of Data

Primary study source: Annual records of arrivals and market prices of the Hingoli Agricultural Produce Market Committee for the period 2021–22 to 2025–26. (Hingoli APMC, 2021–22–2025–26).

For supplementary references, official information from the Maharashtra State Agricultural Marketing Board, Hingoli District Administration, and the Indian Council of Agricultural



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Research (ICAR) has been used. The official system of the Maharashtra State Agricultural Marketing Board (MSAMB) provides available market-committee-wise information on arrivals and market prices. (MSAMB, 2026; Hingoli District Administration, 2026; ICAR, 2026).

6.3 Statistical Methods

Mean (Kothari & Garg, 2019).

Standard Deviation (SD) (Kothari & Garg, 2019).

Coefficient of Variation (CV) (Kothari & Garg, 2019).

Percentage Increase/Decrease (Kothari & Garg, 2019).

Linear Trend (Kothari & Garg, 2019).

Coefficient of Determination (R^2) (Kothari & Garg, 2019).

Pearson Correlation (Kothari & Garg, 2019).

6.4 Important Methodological Note

Records reported in different units have not been combined. For example, the record of pigeon pea in “numbers” for 2021–22 has not been included in the arrivals measured in quintals. (Hingoli APMC, 2021–22–2025–26).

Where a crop record was not available for a particular year, it was not assumed to be zero. (Hingoli APMC, 2021–22–2025–26).

7. Year-wise Arrivals of Major Crops

Unit: Quintals

Crop	2021–22	2022–23	2023–24	2024–25	2025–26
Turmeric/Turmeric Rhizomes	176,282	194,323	264,406	236,931	319,519
Soybean	117,654	156,245	160,208	185,633	159,885
Chickpea	36,083	44,282	43,946	52,046	48,166
Pigeon Pea	29,379	25,986	35,948	27,483	44,093
Wheat	6,946	7,935	13,589	14,448	15,085
Sorghum	2,274	2,080	2,440	4,542	4,284
Groundnut Pods	26,778	10,594	14,077	24,370	19,844
Green Gram (Moong)	515	197	578	7,045	—
Black Gram (Urad)	1,488	332	429	494	—

Note: The available quintal records for sorghum in 2021–22 and 2023–24 have been compiled. “—” indicates that no record was available.



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8. Mean, Standard Deviation and Coefficient of Variation

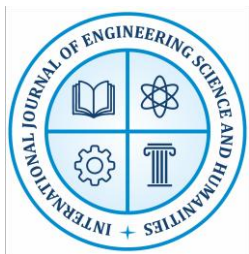
Crop	N	Mean	SD	CV (%)
Turmeric/Turmeric Rhizomes	5	238,292.20	57,140.47	23.98
Soybean	5	155,925.00	24,399.60	15.65
Chickpea	5	44,904.60	5,932.19	13.21
Pigeon Pea	5	32,577.80	7,476.62	22.95
Wheat	5	11,600.60	3,850.47	33.19
Sorghum	5	3,124.00	1,187.08	38.00
Groundnut	5	19,132.60	6,798.08	35.53
Green Gram (Moong)	4	2,083.75	3,311.70	158.93
Black Gram (Urad)	4	685.75	538.96	78.59

Interpretation: The CV is comparatively low for chickpea and soybean. Therefore, based on the available five-year data, their arrivals appear relatively stable. Sorghum and groundnut show comparatively greater variation. Although the CV is high for green gram and black gram, only four observations are available for each; therefore, a firm conclusion regarding their long-term stability should be avoided.

9. Increase/Decrease and Linear Trend

Crop	Increase/Decrease (%)	Slope	R ²
Turmeric/Turmeric Rhizomes	+81.25	+32,908.2	0.829
Soybean	+35.89	+11,385.0	0.544
Chickpea	+33.49	+3,193.0	0.724
Pigeon Pea	+50.08	+3,092.5	0.428
Wheat	+117.18	+2,279.1	0.876
Sorghum	+88.39	+648.2	0.745
Groundnut	-25.89	-9.2	~0.000
Green Gram*	+1,267.96	+1,997.1	0.606
Black Gram*	-66.80	-288.5	0.478

Wheat shows the highest increase of 117.18% from the initial year to the final available year. Turmeric has $R^2 = 0.829$, indicating a positive linear trend. For green gram and black gram, the final available year is 2024–25. (Hingoli APMC, 2021–22–2025–26).



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Interpretation: The highest increase from the initial year to the final year is observed in wheat (117.18%), followed by sorghum (88.39%) and turmeric (81.25%). The R^2 value of 0.829 for turmeric indicates a comparatively clear positive linear trend in the available observations. (Hingoli APMC, 2021–22–2025–26).

10. Separate Analysis of Turmeric

Year	Arrivals (quintals)	Change from Previous Year
2021–22	176,282	—
2022–23	194,323	+10.23%
2023–24	264,406	+36.07%
2024–25	236,931	–10.39%
2025–26	319,519	+34.86%

The five-year average turmeric arrivals are 238,292.20 quintals, with an SD of 57,140.47 and a CV of 23.98%. After a decline in 2024–25, arrivals increased by 34.86% in 2025–26. Thus, although there is an overall increasing trend during the study period, year-to-year fluctuations are evident. (Hingoli APMC, 2021–22–2025–26).

Turmeric arrivals declined in 2024–25 and increased substantially in 2025–26. Therefore, instead of stating that arrivals “increased continuously every year,” it is statistically appropriate to state that there was “an increasing trend over the overall period, with year-to-year fluctuations.” (Hingoli APMC, 2021–22–2025–26).

11. Relationship between Turmeric Arrivals and Market Price

Year	Arrivals (quintals)	Modal Price (₹/quintal)
2021–22	176,282	7,146
2022–23	194,323	6,563
2023–24	264,406	11,034
2024–25	236,931	13,163
2025–26	319,519	12,674

The Pearson correlation coefficient (r) based on five annual observations is +0.805. A positive correlation is observed in the available observations; however, correlation does not imply causation. This analysis does not establish that prices increased because arrivals increased, or that arrivals increased because prices increased. (Hingoli APMC, 2021–22–2025–26).

12. Major Findings

1. Turmeric/turmeric rhizomes and soybean have comparatively large arrivals at the Hingoli Agricultural Produce Market Committee (APMC).
2. Turmeric arrivals increased by 81.25% between 2021–22 and 2025–26.
3. Turmeric shows a positive linear trend, with $R^2 = 0.829$.



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4. Soybean arrivals increased by 35.89% compared with the initial year.
5. Chickpea arrivals increased by 33.49%, while pigeon pea arrivals increased by 50.08%.
6. Wheat arrivals increased by 117.18%.
7. Groundnut arrivals decreased by 25.89% compared with the initial year.
8. Chickpea and soybean show comparatively low CV values.
9. A positive correlation was observed between turmeric arrivals and the modal market price in the available observations.
10. Arrivals recorded at the Hingoli Agricultural Produce Market Committee (APMC) are conceptually different from total agricultural production in the district.

13. Verification of Hypotheses

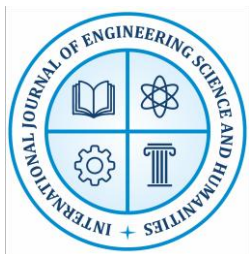
Hypothesis	Result
There are year-wise changes in the arrivals of major crops.	Supported
Turmeric arrivals at the APMC show an increasing trend.	Supported by the available data
The stability of arrivals varies among crops.	Supported
There is a statistical relationship between turmeric arrivals and the modal price.	A positive correlation was observed

14. Conclusion

The study clearly shows that year-wise changes occurred in the arrivals of major crops at the Hingoli Agricultural Produce Market Committee during 2021–22 to 2025–26. Turmeric/turmeric rhizomes and soybean recorded comparatively large arrivals, and turmeric showed a clear increasing linear trend during the study period. In particular, turmeric arrivals reached 319,519 quintals in 2025–26, the highest level recorded during the study period. (Hingoli APMC, 2021–22–2025–26).

However, these figures cannot be interpreted as meaning that turmeric production in Hingoli district was 319,519 quintals. This figure represents arrivals recorded at the Hingoli Agricultural Produce Market Committee. If agricultural produce enters the market from areas outside the market committee's operational area, such produce may also be included in the arrivals. When the place of origin of the produce is not available in the data, it would not be appropriate to estimate the quantity originating from outside the area. (Hingoli APMC, 2021–22–2025–26).

Therefore, it is scientifically appropriate to limit the principal conclusion of the study to “the trend of market arrivals at the Hingoli APMC.” (Hingoli APMC, 2021–22–2025–26).



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15. Suggestions

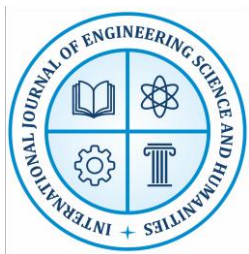
1. Crop-wise monthly arrival records at the Hingoli Agricultural Produce Market Committee (APMC) should be made regularly available.
2. Wherever possible, the place of origin of agricultural produce should be classified by taluka/area.
3. Separate databases should be developed for turmeric production, the quantity brought to the market for sale, and APMC arrivals.
4. Along with arrivals, information on quality, variety/grade, market price, and quantity sold should be recorded.
5. The market catchment area of turmeric should be studied separately.
6. Monthly or weekly data should be used instead of annual data for future studies of the arrivals–price relationship.
7. Long-term trend analysis should be undertaken using the digital data of the Agricultural Produce Market Committee (APMC).

16. Limitations of the Study

1. The study is based on the available Agricultural Produce Market Committee (APMC) records.
2. Where records for certain crops and years were unavailable, they were not treated as zero.
3. Records reported in different units were not combined.
4. Since the place of origin of produce arriving at the APMC was not available, the quantity originating from outside areas could not be determined.
5. Only five annual observations are available for the turmeric arrivals–price correlation.
6. A linear trend indicates a statistical trend; it does not explain causation.

17. Final Research Conclusion

“During 2021–22 to 2025–26, significant year-wise variation was observed in the arrivals of major crops at the Hingoli Agricultural Produce Market Committee. Turmeric/turmeric rhizomes and soybean were comparatively more important in terms of market arrivals, and turmeric showed a positive increasing trend during the study period. However, the arrivals recorded at the Agricultural Produce Market Committee (APMC) do not directly represent the total agricultural production of Hingoli district. Therefore, agricultural market analysis should consider market arrivals, agricultural production, and the operational area of the market committee as three distinct components.”



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