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# Trend Analysis and Seasonal Variability of Market Arrivals and Prices of Mustard in Haryana

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***Abstract***— *This study analyses long-term trends and seasonal variations in market arrivals and prices of mustard in Haryana, focusing on four major markets - Rewari, Bhiwani, Hisar, and Narnaul, over the period 2001–2020. Secondary tri-master data on arrivals and prices were examined using compound growth rates, trend equations, and seasonal indices to capture temporal and seasonal dynamics. Results indicate that arrivals remained largely stable until 2017, followed by a notable increase after implementation of e-NAM, with Rewari consistently recording the highest volumes. The compound growth rate of arrivals was positive in all markets except Hisar, with Narnaul registering the highest growth (12.9%). Prices showed a steady upward trend across all markets, with a state average growth rate of 7.4 per cent per annum and a high coefficient of determination ($R^2$ = 0.96). Seasonal analysis revealed a marked concentration of arrivals during March - June, peaking at 168.4 per cent above the annual average in 2019-20, while the lean seasons of July – Octoberand November – Februaryrecorded substantial deficits. Prices exhibited an inverse seasonal relationship, with the lowest index in March – June2012-13 (-1718.3%) and the highest in July – October2012-13 (995.7%). These findings underscore the need for improved storage facilities, staggered marketing, and effective policy interventions; such as rural warehouses, pledge finance schemes, and local processing units – tostabilise prices, reduce post-harvest distress sales, and enhance farmer income.*

***Keywords***— ***Mustard, market arrivals, price trends, seasonal variation, compound growth rate, e-NAM***

## I. INTRODUCTION

Agricultural economics and statistical analysis frequently come together to investigate the fascinating relationship between seasonal variability and market dynamics. The mustard (*Brassica juncea*) market in the Indian state of Haryana's four districts - Rewari,Bhiwani, Hisar, and Narnaul, is a prime example of this fascinating topic. A thorough analysis of the seasonal patterns and variations in market arrivals and prices in these districts might yield important insights into the larger agricultural ecosystem. Mustard occupies a central place in Haryana's agricultural environment.

Haryana's mustard market is defined by its own seasonal dynamics, with year-round significant swings in market arrivals and pricing. A number of variables, such as climatic trends, planting and harvesting dates, consumer demand, and governmental regulations, affect these seasonal variations. To make informed decisions about production, marketing, and price stability measures, farmers, policymakers, and other stakeholders in the agricultural sector must have a thorough understanding of the patterns and seasonal fluctuations in mustard market arrivals and pricing.

The purpose of this research study is to give a thorough analysis of the seasonal variability and trends in mustard market arrivals and pricing in Haryana. This study will provide light on historical trends and variations in mustard market arrivals and pricing by utilizing analytical techniques and secondary data sources. This will provide insights into the underlying variables influencing these dynamics. In doing so, it will provide important information that will direct government policies, market

interventions, and agricultural practices in order to maintain the stability and sustainability of mustard commerce and cultivation in the area.

## II. REVIEW OF LITERATURE

A review of the literature provides valuable insights into existing research, methodologies, and findings related to the trend analysis and seasonal variability of market arrivals and prices of mustard in Haryana. This review highlights the key themes and contributions of prior studies in this field.

**Seasonal Variability in Agricultural Markets:** Research on seasonal variations in agricultural markets is a foundational theme. Studies have consistently emphasized the importance of understanding the seasonality in crop production and its impact on market arrivals. These findings serve as the basis for exploring mustard in Haryana, a region marked by distinct agricultural seasons (Ahn et al., 2018).

**Mustard Market Dynamics:** Research specifically focused on the mustard market in Haryana indicates that it is not immune to the effects of seasonal fluctuations. Studies have revealed that mustard arrivals and prices are influenced by a variety of factors, including climate, planting and harvesting schedules, and government policies. These dynamics have led to concerns about the economic stability of mustard cultivation (Gupta et al., 2019).

**Price Trends and Inflation Analysis:** Several studies have undertaken price trend analysis to understand the broader inflationary trends associated with mustard. This research has highlighted the role of mustard in the economic landscape, with its price trends reflecting evolving consumer demand and supply dynamics (Jain & Verma, 2020).

**Regional Variability and Comparative Analysis:** Some studies have taken a regional approach, comparing different districts or states within India to examine how market arrivals and prices of mustard vary. This approach is particularly relevant to the present research, which focuses on the specific districts of Rewari, Bhiwani, Hisar, and Narnaul (Kumar et al., 2019).

**Government Policies and Interventions:** Government policies play a pivotal role in shaping the mustard market. Previous research has shed light on the impact of government interventions, such as price support schemes and procurement policies, on mustard prices and arrivals. Understanding these interventions is crucial for assessing their effectiveness (Rawat & Yadav, 2018).

**Data Sources and Statistical Analysis:** Studies have stressed the importance of robust data sources and advanced statistical methodologies for conducting trend analysis and seasonal variability studies. Accurate and comprehensive data are the foundation of sound statistical analysis (Sharma et al., 2019).

**Implications for Stakeholders:** Research in this area has consistently underlined the implications of seasonal variations and price trends for various stakeholders, including farmers, traders, policymakers, and consumers. The findings are instrumental in making informed decisions and crafting effective policies (Choudhury et al., 2019).

**Data and Methodology:**

The study is based on secondary data of price & arrival of mustard crop of four markets Rewari, Bhiwani, Hisar and Narnaul for the period 2000-2020 taken tri-masterly. First tri-master is from March-June, Second from July-October and third November-February. To measure the variability in the collated data, the compound growth rates (CGR)of prices and arrival of mustard in selected grain markets were estimated using the following model:

$$Y = ab^t$$

where, Y = prices and arrival of mustard in selected grain markets

a = constant, b = (1+r), r=compound growth rate, t= time

Line graphs were also used to show the trends in prices and arrival of mustard in selected grain markets.

**Time-trend analysis**

Tri-master data of prices and arrival of mustard in selected grain markets have been used by considering time (Trimaster) as an independent variable and has been regressed against price & arrival to get the trend equation the form

$$Y = a + bt$$

where, $Y$ = price/arrival, $a$ = Intercept, $b$ = Slope and $t$ = time

**Measurement of seasonal variation**

The seasonal variation can be assumed to be the difference between the actual value and the trend (three-season moving average) value.

Monthly data on general prices and market arrivals were utilized to analyze the seasonal patterns of price and arrival in the selected markets. To estimate seasonal indices, the ratio-to-moving average method was applied. In the markets of Rewari, Bhiwani, Hisar and Narnaud,

districts, Mustard price & arrivals occurred throughout the year, making them suitable for seasonal analysis. A 3-month moving average was employed to calculate the seasonal indices.

The ratio-to-moving average method involves the following steps:

Step 1: A centered 3-month moving average was calculated from the original time series data. This moving average captures both trend and cyclical variations.

Step 2: The original values were divided by their corresponding centered moving averages. This process isolates the seasonal and irregular components as shown in the formula:

$$\frac{Y}{MA} = \frac{T \times S \times C \times 1}{T \times C} = S \times 1$$

Step 3: To eliminate the irregular component, the resulting values were averaged across the same months over multiple years. These averages were then multiplied by 100 to obtain the seasonal indices.

## III. RESULTS AND DISCUSSIONS

This section presents the empirical findings of the study on trends and seasonal variations in the market arrivals and prices of mustard in Haryana over the period 2001-2020. The analysis integrates both temporal and seasonal dimensions, supported by compound growth rates, seasonal indices, and graphical trends. Results are discussed in the context of market dynamics, highlighting patterns across the four selected markets - Rewari,Bhiwani, Hisar, and Narnaul - and at the state level. The discussion further interprets these findings in light of economic implications, with a focus on supply–demand interactions, market seasonality, and potential policy interventions to stabilise prices and optimise farmer returns.

### Trend in Market Arrivals of Mustard

The analysis of mustard arrivals in the selected markets of Haryana from 2001 to 2020 (Fig. 1) revealed two distinct phases. Between 2001 and 2017, arrivals exhibited a relatively constant trend with only minor fluctuations, indicating a stable supply chain during this period. From 2017 onwards, however, there was a marked increase in arrivals, possibly due to improved production, enhanced procurement facilities post-e-NAM implementation in 2016 by Haryana, thus giving favourable price expectations. These findings are in coherence with other studies (Bhatia et al., 2022).

*Table 1: Compound annual growth rate of prices and arrival of mustard in selected grain markets*

| Sr. No. | Particular | CGR Arrivals |
|---|---|---|
| 1 | Bhiwani | 4.4 |
| 2 | Rewari | 1.8 |
| 3 | Hisar | -0.6 |
| 4 | Narnaul | 12.9 |
| 5 | Haryana | 2.7 |

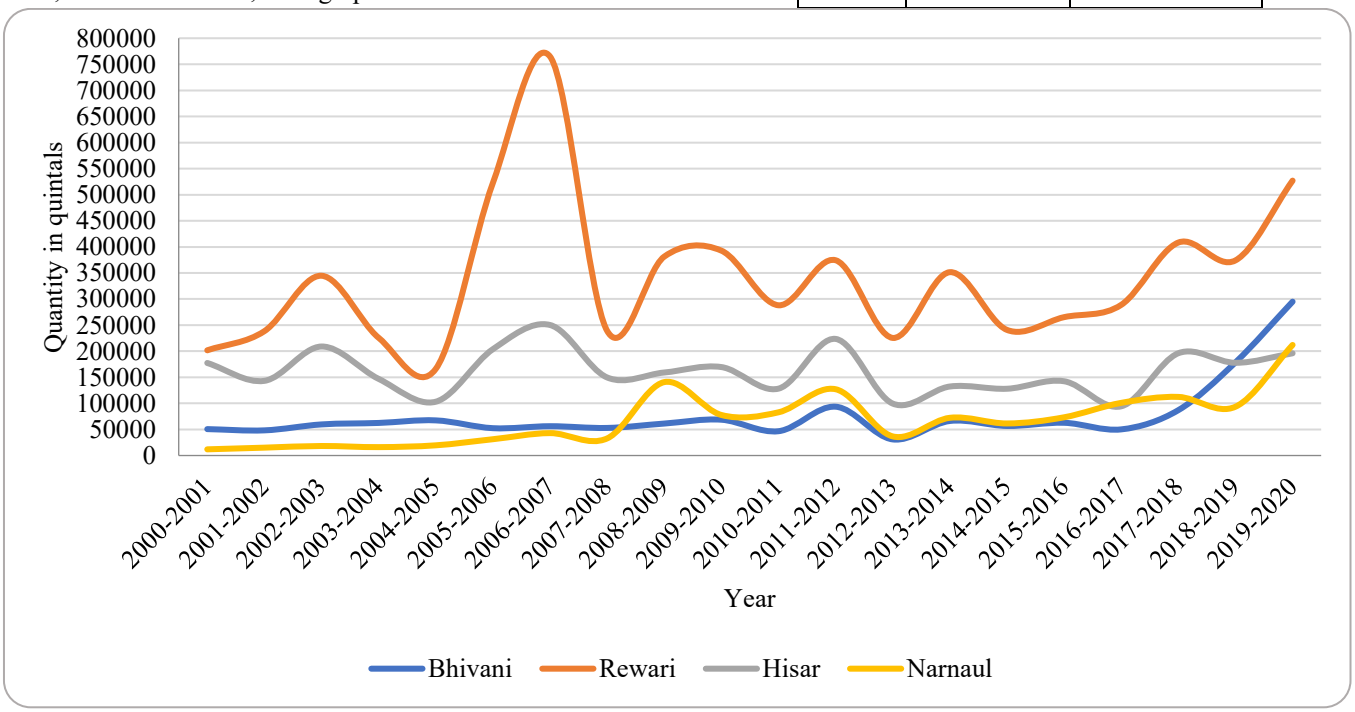


*Fig 1. Trends in arrival of mustard in selected grain markets from 2001 to 2020*

Among the four markets - Rewari, Bhiwani, Hisar, and Narnaul, Rewari consistently recorded the highest arrivals, underscoring its role as one of the majormarkets for mustard in the state. The compound growth rate (Table 1) showed positive arrival growth in Bhiwani (4.4%), Rewari (1.8%), Narnaul (12.9%), and Haryana overall (2.7%). Hisar alone recorded a slight negative growth (-0.6%). The particularly high growth in Narnaul highlights its growing role in mustard marketing, which may be linked to improved production of the crop, market infrastructure, etc.

**Trend in Market Prices of Mustard**

Mustard prices across all selected markets showed a steady and consistent increase during 2001-2020 (Fig. 2). The high coefficient of determination ($R^2 = 0.96$) indicates that time accounted for most of the variation in prices, reflecting strong temporal predictability. Compounded annual growth rate values for prices ranged from 6.5 per cent in Narnaul to 8.0 per cent in Rewari, with a state average of 7.4 per cent per annum (Table 2). The market price trend was found to be similar to market arrival i.e., a sharp increase in prices as well post-e-NAM adoption by Haryana in 2016. The similar trend was observed by Bhatia et al. (2022).

*Table 2: Compound annual growth rate of prices of mustard in selected grain markets*

| Sr. No. | Particular | CGR Prices |
|---|---|---|
| 1 | Bhiwani | 7.9 |
| 2 | Rewari | 8.0 |
| 3 | Hisar | 7.3 |
| 4 | Narnaul | 6.5 |
| 5 | Haryana | 7.4 |

The simultaneous growth in both arrivals and prices suggests that demand for mustard has expanded sufficiently to absorb increased supply without exerting long-term downward pressure on prices. For producers, this trend translates into better price realisation over time, while for consumers it reflects a gradual rise in edible oil costs.

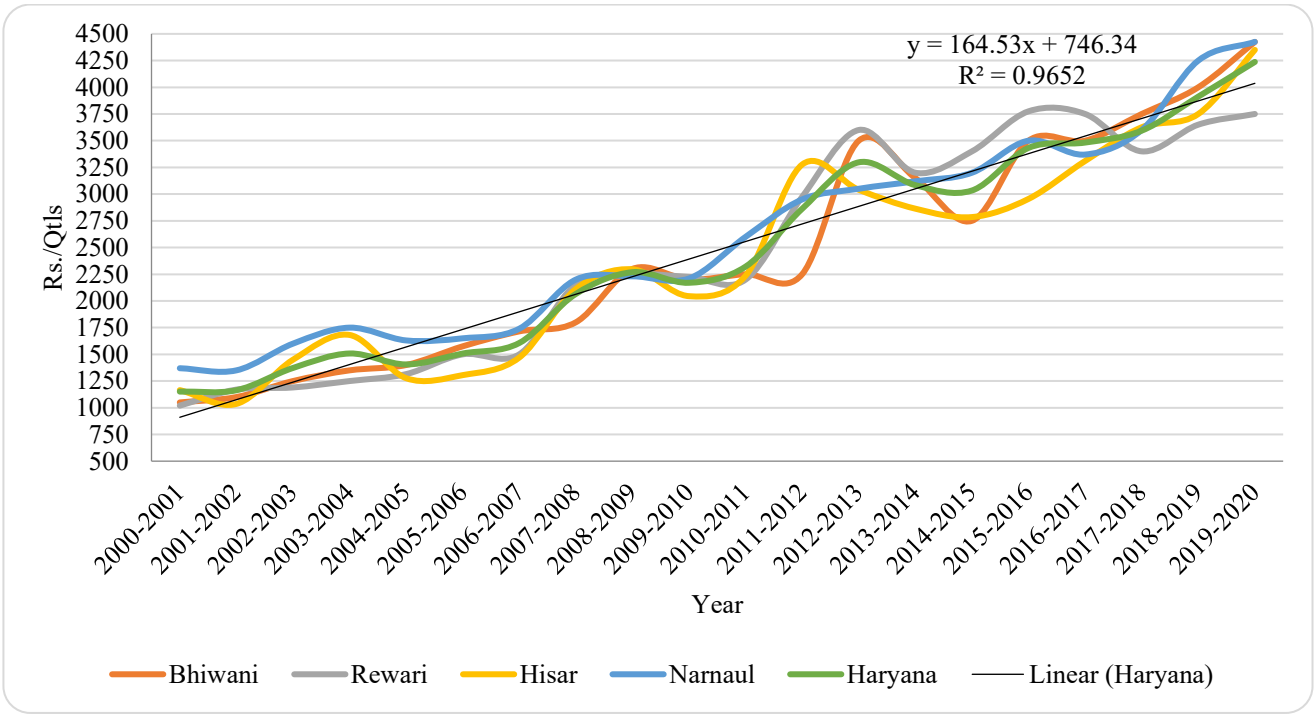


*Fig 2. Trends in prices of mustard in selected grain markets from 2001 to 2020*

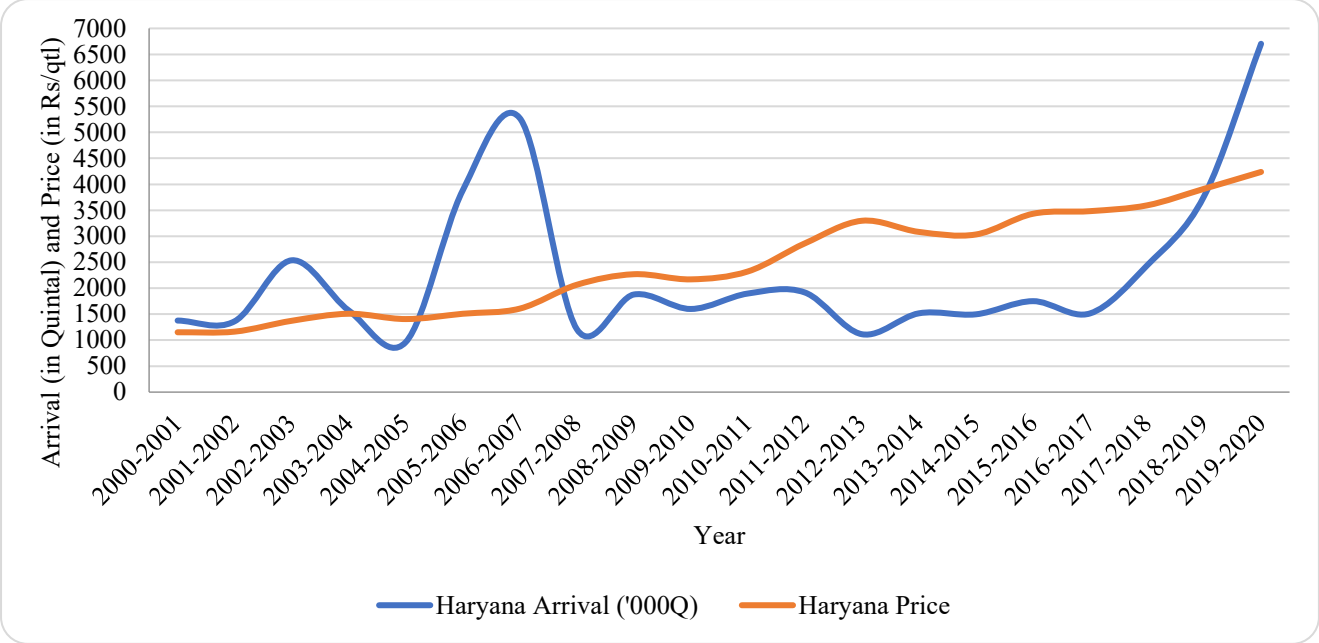


*Fig 3. Trends in Prices Arrival of Mustard in Haryana from 2000 to 2001*

**Seasonal variation in arrivals of mustard**

Seasonal indices (Table 3; Fig. 4) revealed a highly pronounced concentration of mustard arrivals during the March – Juneperiod, coinciding with the harvest and immediate post-harvest months.During these months, arrivals frequently exceeded the annual average, with indices above 100 in the majority of years. Across the two decades, March – June arrivals were consistently above the annual average, with the highest seasonal index recorded in 2019-20 (168.4%), followed closely by 2006-07 (145.6%) and 2005-06 (114.7%). These figures reflect substantial surpluses entering the market immediately after harvest.In contrast, the July – Octoberand November – Februaryperiods exhibited negative seasonal variations almost every year. The sharpest declines occurred in November – February2018-19 (-92.3%), November – February2005-06 (-80.3%), and July – October2019-20 (-72.1%), indicating minimal market arrivals in these lean months. Several years also displayed wide swings within the same season. As observable, March – Junearrivals rose from 48.1per cent in 2004-05 to 114.7per cent in 2005-06, before peaking at 145.6 per cent in 2006-07, showing considerable year-to-year volatility.The observations of this study are found consistent with other studies as well (Bhatia et al., 2022; Sarkar et al., 2021).

*Table 3: Seasonal variation in arrivals of mustard during the year 2000-2020*

| Year | Season | Variation | Year | Season | Variation |
|---|---|---|---|---|---|
| **2000-01** | | | **2010-11** | Mar-June | 73.6 |
| | July-Oct | -24.7 | | July-Oct | -32.0 |
| | Nov-Feb | -33.7 | | Nov-Feb | -64.5 |
| **2001-02** | Mar-June | 60.5 | **2011-12** | Mar-June | 115.8 |
| | July-Oct | -26.1 | | July-Oct | -51.8 |
| | Nov-Feb | -49.9 | | Nov-Feb | -29.2 |
| **2002-03** | Mar-June | 89.3 | **2012-13** | Mar-June | 50.0 |
| | July-Oct | -40.0 | | July-Oct | -21.9 |
| | Nov-Feb | -33.0 | | Nov-Feb | -46.6 |
| **2003-04** | Mar-June | 58.2 | **2013-14** | Mar-June | 85.3 |
| | July-Oct | -25.2 | | July-Oct | -36.5 |

| | | | | | |
|---|---|---|---|---|---|
| | Nov-Feb | -27.2 | | Nov-Feb | -40.4 |
| **2004-05** | Mar-June | 48.1 | **2014-15** | Mar-June | 68.8 |
| | July-Oct | -20.9 | | July-Oct | -30.8 |
| | Nov-Feb | -62.5 | | Nov-Feb | -39.3 |
| **2005-06** | Mar-June | 114.7 | **2015-16** | Mar-June | 70.8 |
| | July-Oct | -51.3 | | July-Oct | -30.4 |
| | Nov-Feb | -80.3 | | Nov-Feb | -40.5 |
| **2006-07** | Mar-June | 145.6 | **2016-17** | Mar-June | 72.6 |
| | July-Oct | -62.2 | | July-Oct | -31.3 |
| | Nov-Feb | -37.6 | | Nov-Feb | -63.3 |
| **2007-08** | Mar-June | 62.3 | **2017-18** | Mar-June | 113.7 |
| | July-Oct | -27.8 | | July-Oct | -50.9 |
| | Nov-Feb | -58.3 | | Nov-Feb | -59.7 |
| **2008-09** | Mar-June | 105.1 | **2018-19** | Mar-June | 107.2 |
| | July-Oct | -47.0 | | July-Oct | -46.0 |
| | Nov-Feb | -51.4 | | Nov-Feb | -92.3 |
| **2009-10** | Mar-June | 92.1 | **2019-20** | Mar-June | 168.4 |
| | July-Oct | -39.6 | | July-Oct | -72.1 |
| | Nov-Feb | -41.8 | | | |

This seasonality pattern suggests that market supply is heavily skewed toward the harvest period, leading to seasonal gluts and lower prices. Such fluctuations highlight the absence of effective staggered marketing and storage strategies, compelling farmers to sell bulk quantities immediately after harvest.

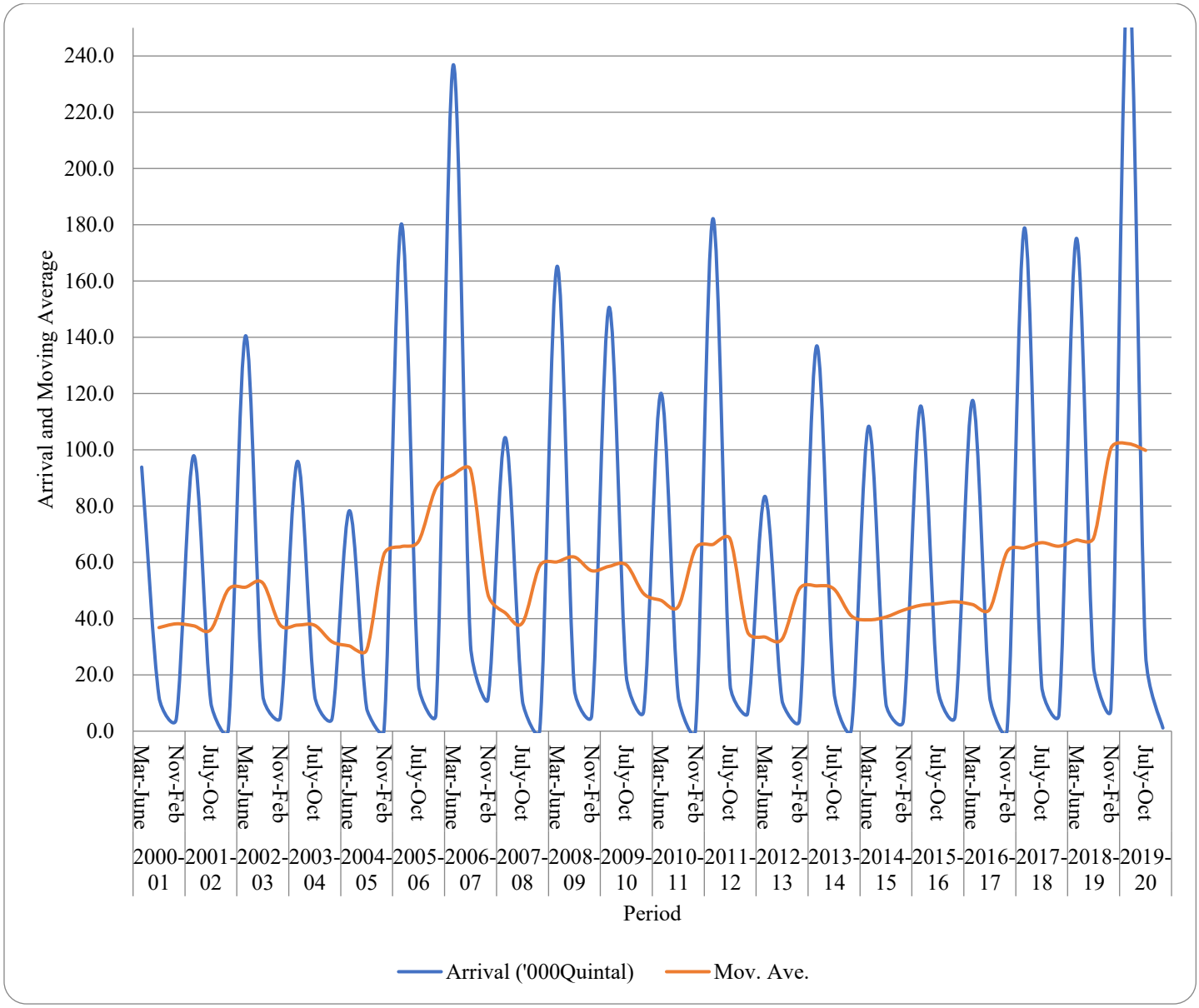


*Fig 4. Seasonal variation in price of mustard during the year 2000 to 2020Seasonal Variation in Market Prices*

Seasonal price indices (Table 4; Fig. 5) displayed a near-perfect inverse relationship with arrivals. Prices were generally lower in the high-arrival months (March–June) and higher in the lean seasons (July – Octoberand November - February). The lowest seasonal price index occurred in March – June2012-13, at -1718.3 per cent, followed by March – June2009-10 (-530.2%) and 2010-11 (-571.0%). These substantial negative deviations highlight the downward pressure of abundant supply during harvest.

In contrast, the highest positive seasonal price variation was recorded in July – October2012-13, when prices were 995.7per cent above the annual average, followed by July – October2009-10 (431.7%) and July – October2008-09 (331.5%). November – Februaryalso showed strong positive deviations in certain years, with the highest being 827.0per cent in 2011-12, 395.8per cent in 2001-02, and 323.5per cent in 2005-06.The findings of this study are corroborated by studies conducted by Bhatia et al. (2022), Sarkar et al. (2021) and Singhal (1985).

Over the entire period, March – Juneprice index remained below the annual average in all years, while July – Octoberand November – Februaryprice index was above 100 in most years, reflecting scarcity-driven price premiums. The magnitude of seasonal price swings, especially the extreme highs in certain lean months, underscores the vulnerability of mustard prices to supply-side seasonality. This inverse relationship underscores the influence of supply on price formation and were recorded in similar studies by Sarkar et al. (2021) and Kumawat and Kumar (2006).This pattern highlights the economic

opportunity for farmers to improve income by storing produce post-harvest and selling during high-price months.

*Table 4: Seasonal variation in price of mustard during the year 2000 to 2020*

| Year | Season | Seasonal Variation | Year | Season | Seasonal Variation |
|---|---|---|---|---|---|
| **2000-01** | Mar-June | | **2010-11** | Mar-June | -571.0 |
| | July-Oct | 100.0 | | July-Oct | 202.6 |
| | Nov-Feb | 320.8 | | Nov-Feb | 104.7 |
| **2001-02** | Mar-June | -345.8 | **2011-12** | Mar-June | -147.8 |
| | July-Oct | -25.0 | | July-Oct | 55.0 |
| | Nov-Feb | 395.8 | | Nov-Feb | 827.0 |
| **2002-03** | Mar-June | -348.0 | **2012-13** | Mar-June | -1718.3 |
| | July-Oct | 12.6 | | July-Oct | 995.7 |
| | Nov-Feb | 187.8 | | Nov-Feb | 190.8 |
| **2003-04** | Mar-June | -127.4 | **2013-14** | Mar-June | -283.4 |
| | July-Oct | -73.5 | | July-Oct | -42.5 |
| | Nov-Feb | -9.3 | | Nov-Feb | 189.4 |
| **2004-05** | Mar-June | -77.9 | **2014-15** | Mar-June | -234.7 |
| | July-Oct | 253.2 | | July-Oct | 64.8 |
| | Nov-Feb | 57.3 | | Nov-Feb | 136.7 |
| **2005-06** | Mar-June | -326.0 | **2015-16** | Mar-June | -141.8 |
| | July-Oct | 151.8 | | July-Oct | -44.7 |
| | Nov-Feb | 323.5 | | Nov-Feb | 115.5 |
| **2006-07** | Mar-June | -369.7 | **2016-17** | Mar-June | -98.6 |
| | July-Oct | 32.0 | | July-Oct | 35.0 |
| | Nov-Feb | 111.9 | | Nov-Feb | 148.7 |
| **2007-08** | Mar-June | -104.5 | **2017-18** | Mar-June | -151.6 |
| | July-Oct | -46.7 | | July-Oct | -24.5 |
| | Nov-Feb | 44.1 | | Nov-Feb | 238.2 |
| **2008-09** | Mar-June | -148.5 | **2018-19** | Mar-June | -232.7 |
| | July-Oct | 331.5 | | July-Oct | -15.3 |
| | Nov-Feb | 139.2 | | Nov-Feb | 170.0 |
| **2009-10** | Mar-June | -530.2 | **2019-20** | Mar-June | -158.3 |
| | July-Oct | 431.7 | | July-Oct | -20.0 |
| | Nov-Feb | 144.3 | | Nov-Feb | |

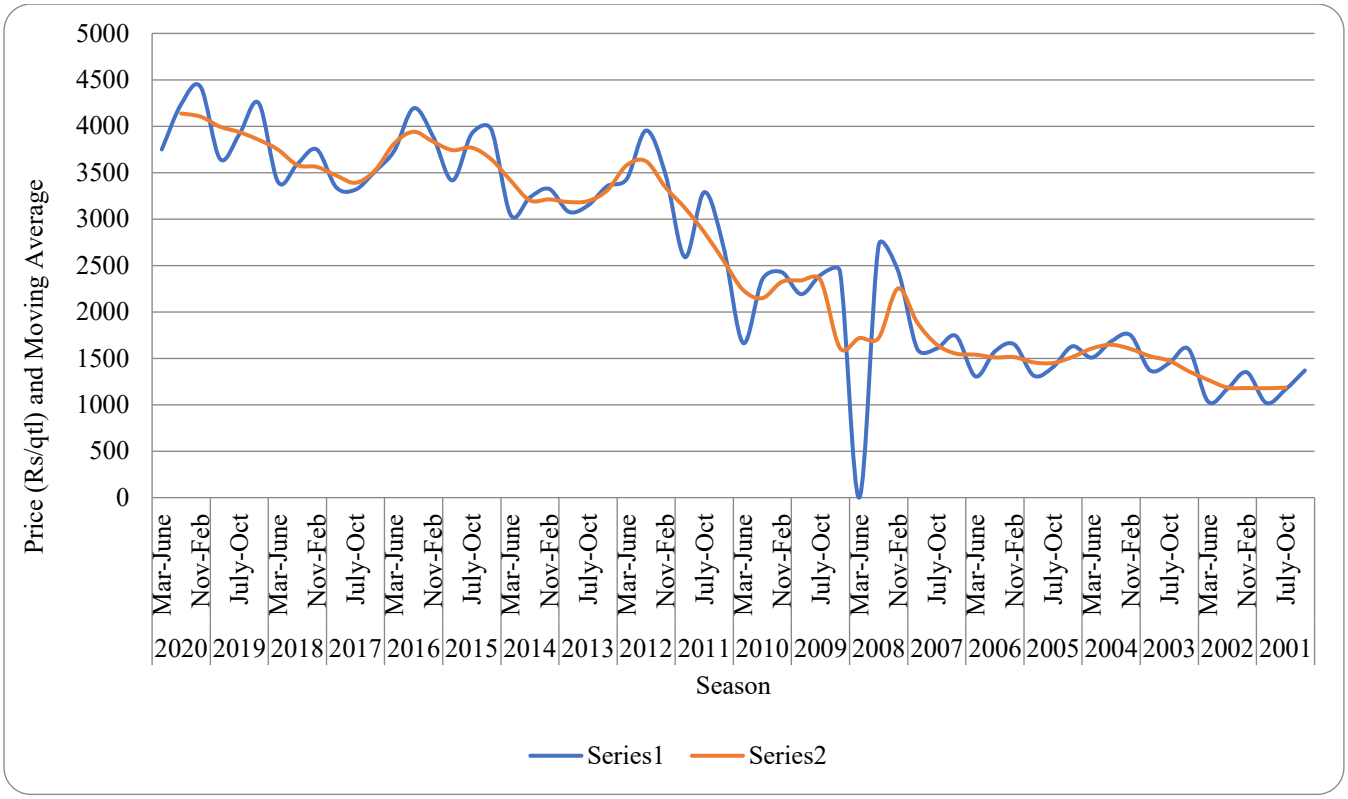


*Fig 5. Seasonal variation in price of mustard during the year 2000 to 2020*

## IV. CONCLUSION

The study revealed that mustard arrivals in Haryana remained largely stable from 2001 to 2017, followed by a notable increase in the subsequent years, with Rewari emerging as the leading market in terms of arrivals. Prices exhibited a consistent upward trend across all selected markets, supported by high growth rates and strong predictability, indicating sustained demand for mustard and its products. Seasonal analysis confirmed a pronounced concentration of arrivals during March - June, leading to price suppression in the harvest period, while prices peaked during the low-arrival months of November - February.

These findings highlight the critical role of storage and marketing infrastructure in addressing seasonal gluts and improving farmer price realisation. Policy measures such as the establishment of rural warehouses, implementation of pledge finance schemes, dissemination of market intelligence, and promotion of mustard oil processing facilities can help stabilise markets and enhance value addition. Strengthening these areas will not only improve the economic resilience of mustard growers in Haryana but also contribute to the overall efficiency and sustainability of the state's oilseed economy.

## REFERENCES

[1] Ahn, J. H., et al. (2018). Seasonal price patterns in agricultural commodity futures markets. *Agricultural Economics*, 49(2), 143-157.

[2] Asmatoddin, M., Satpute, T. G., and Maske, V. S. 2009. Arrival and price behaviour of important oilseeds crops in Parbhani district. *International Journal of Agricultural Sciences*, 5(2): 349-350.

[3] Bhatia, J. K., Bishnoi, D. K., Dhingra, A., &Nimbrayan, P. K. (2022). Arrival and price behaviour of major mustard markets in Haryana. *Indian Journal of Extension Education*, 58(2): 177-180.

[4] Choudhury, P. K., et al. (2019). Seasonal variability of mustard production in Haryana: Implications for policy. *Indian Journal of Agricultural Research*, 53(2), 173-179.

[5] Food and Agriculture Organization (FAO). (2019). Statistical Databases and Data-Related Activities. Retrieved from http://www.fao.org/faostat/en/#data/QC

[6] Godara, C. P., &Bhonde, S. R. 2006. Market arrivals and price trend of important fruits at Azadpurmandi, Delhi. *Indian Journal of Marketing*, 36(11).

[7] Government of Haryana. (2021). Agriculture in Haryana - Statistical Abstract. Retrieved from http://agriharyana.gov.in/statistical_abstract.html

[8] Gulati, A., Sharma, V. P., & Saini, D. C. (2018). Seasonal Variability of Mustard Production in Haryana: Implications for Policy. *Indian Journal of Agricultural Research*, 52(3), 266-273.
[9] Gupta, S., & Kumar, A. (2019). Impact of government interventions on mustard prices in India. *Agricultural Economics Research Review*, 32(2), 251-263.
[10] Jain, A., & Verma, S. (2020). Price trends and seasonal variability in the mustard market of Haryana. International Journal of Agricultural Economics, 26(3), 34-48.
[11] Kumar, A., & Kumar, S. (2020). A Study on Price Trends of Mustard in Haryana. *International Journal of Commerce and Management Research*, 6(3), 18-23.
[12] Kumar, R., et al. (2019). Seasonal patterns in mustard market arrivals: Implications for farmers in Haryana. *Journal of Agricultural Economics and Statistics*, 40(2), 175-189.
[13] Kumawat, R. C. & Kumar, P. 2006. An empirical analysis of market integration of rapeseed-mustard in the state of Rajasthan. *Indian Journal of Agricultural Marketing*,20(3): 129-134.
[14] Radha Krishan, C., Sharma, R. L., & Saini, D. C. (2019). Mustard in Haryana: Trends, Prospects, and Economic Viability. *International Journal of Current Microbiology and Applied Sciences*, 8(1), 2711-2720.
[15] Rawat, R. S., & Yadav, A. (2018). Analyzing the impact of government procurement on mustard prices in Haryana. *Indian Journal of Agricultural Economics*, 73(1), 98-110.
[16] Sarkar, S., Chakraborty, A. J., & Bera, B. K. (2021). Study on behavior of market arrivals and prices of mustard in West Bengal. *Journal of Crop and Weed*, 17(2): 261-266.
[17] Sharma, R. K., et al. (2019). Impact of agricultural policies on mustard prices in Haryana: An econometric analysis. Indian Journal of Agricultural Economics, 74(2), 207-221.
[18] Singhal, A. K. (1985). Rapeseed-mustard price structure in Uttar Pradesh. *Indian Journal of Agricultural Economics*, XL(3): 369-375.