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# Price Behaviour of Selected Onion Markets in Maharashtra

***Sirigineedi Vasanthi[1*], D.S. Perke[2], S.S. More[3] and S.V. Bharati[4]***
*[1]M.Sc. Student, Department of Agricultural Economics,*
*VNMKV, Parbhani (Maharashtra), India.*
*[2]Associate Dean & Principal, College of Agriculture Dharashiv,*
*VNMKV, Parbhani (Maharashtra), India.*
*[3]HOD, Department of Agricultural Economics,*
*VNMKV, Parbhani (Maharashtra), India.*
*[4]Assistant Professor, Department of Agricultural Economics,*
*VNMKV, Parbhani (Maharashtra), India.*

*(Corresponding author: Sirigineedi Vasanthi*)*
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**ABSTRACT: The research titled "Price Behaviour of Selected Onion Markets in Maharashtra" analyzed growth performance, seasonality, and price volatility in key onion markets from 2011 to 2023. Data from five major APMCs—Lasalgaon, Pune, Satara, Solapur, and Jalgaon—were used. The Compound Annual Growth Rate (CAGR) showed positive growth in all markets, with Solapur recording the highest arrival growth (10.82%) and Satara the lowest (0.56%). Lasalgaon had the highest price growth (0.32%). Seasonal trends indicated peak onion arrivals from December to March, with prices peaking in November and declining by May. Volatility analysis using the Cuddy-Della Valle Index (CDVI) revealed Jalgaon had the highest arrival instability, while Lasalgaon exhibited the highest price volatility, with a CV of 68.395% and CDVI of 66.740%. Overall, price variability was higher than arrival variability across all markets. The study concludes that while onion arrivals show consistent growth, price volatility remains a significant challenge in Maharashtra's key markets, particularly in Lasalgaon.**

**Keywords:** Market, CAGR, Onion, Price volatility, seasonality.

## INTRODUCTION

Agriculture is crucial in India's economy, with more than 58% of rural households depending on it for their livelihoods. The agriculture and Allied sectors account for 18.4 % of India's GVA at current prices during 2022- 23 (Anonymous, 2023). Coordinating agricultural growth with changes in demand, supply, and marketing is crucial for overall economic development. The Agricultural Produce Market Act of 1939 oversees the sale of agricultural products, with the goal of stabilizing prices and promoting fair trade practices. However, real advancement depends on enhancing the proportion of the consumer's expenditure that reaches the producer. This requires ensuring fair prices for farmers regardless of market conditions. To achieve this, strategies must focus on improving market access, reducing post-harvest losses, and enabling better price realization for farmers. Direct farmer-to-consumer sales, local Agro processing units, and technological innovations in supply chain management are key initiatives to consider. Ultimately, empowering farmers and enhancing their economic well-being is essential for the sustainable growth of India's agricultural sector.

The onion (*Allium cepa*) is an herbaceous biennial plant from the Amaryllidaceae family that was cultivated for its edible bulb. Originally from southwestern Asia, onions are now cultivated globally, especially in temperate regions (Anonymous, 2024a). Though they are low in nutrients, onions are praised for their flavor and are extensively used in cooking. They enhance the taste of a variety of dishes including stews, roasts, soups, and salads, and are also enjoyed as a cooked vegetable. In India onion is mainly cultivated in three distinct seasons, namely Kharif (May-July), Late Kharif (August-September), and Rabi (October-November).

Onions are believed to have originated from Iran, western Pakistan, and Central Asia. Evidence from Bronze Age settlements in China suggests that onions were used as early as 5000 BC. They were valued not only for their flavor but also for the bulb's durability in storage and transport. Onions are believed to have originated in Iran, western Pakistan, and Central Asia.

Findings from Bronze Age settlements in China show that onions were used as early as 5000 BC. They were appreciated not only for their flavor but also for their long-lasting storage and ease of transport (Anonymous, 2024b).

The important onion-growing countries of the world *viz.,* China, India, the USA, Egypt, Turkey, Russia, and Pakistan constitute 60 per cent of world onion production. World onion trade is also mainly determined by these countries. In the world, the yields of onion were found to be the highest in the USA (56.03 tonnes/ha) followed by Iran (37.36 tonnes/ha) and Turkey (35.76 tonnes/ha). Though India ranks 1st in area coverage of onion (1.62 million ha) and in its production (26.64 million tonnes) after China, the per hectare productivity of onion in the country is only 18.70 tonnes (FAO, 2021 statistics). In addition, onions are a significant agricultural commodity exported from India, contributing to the country's agricultural trade. During 2018-19, India exported 2525258.38 MT of onions and earned foreign exchange worth 452279 lakh rupees (Anonymous, 2022).

Maharashtra is the top onion-producing state in India, accounting for 43.08% of the nation's total onion production of 31.6 million tonnes (Indiastatagri, 2022). Other significant onion-producing states include Gujarat, Uttar Pradesh, Orissa, and Karnataka. In Maharashtra, the major onion-growing districts are Nasik, Pune, Solapur, Ahmednagar, Satara, and Jalgaon. Although onions have a greater marketable surplus than many other food crops, price stability is difficult to maintain due to irregular market arrivals. The high price volatility is a major challenge for farmers, mainly caused by fluctuations in production and supply. This instability in prices often reduces farmer's income and negatively impacts consumers as well. As a means to improve their income, farmers have come to understand that proper disposal of their produce is equally crucial as adopting new agricultural technologies. Farmers are unlikely to be drawn to incentives to boost profitability if the marketing mechanism isn't improved. While customers pay greater costs, farmers usually fail to receive adequate prices for their produce. Farmers in the vicinity typically plant the same crop when commodity prices rise, indicating inadequate handling, shipping, storage, and packaging practices. Farmers are ultimately negatively impacted by this circumstance.

## MATERIALS AND METHODS

The study was based on secondary data. Hence, a reliable source of data is very important to get the real picture. Secondary data consisting of monthly prices and arrivals of onion were collected from selected Agriculture Produce Market Committees (APMC) and the data available on AGMARKNET was also utilized for analytical purposes.

Many crops are grown in Maharashtra, but the onion was selected as the study's main focus because it is the most widely grown crop in the state, ranks first in production, is a highly valued crop by farmers, and has substantial economic worth. Additionally, the onion market facilities are highly developed.

The study was constrained to five marketplaces in Maharashtra. Data from five main markets namely Lasalgaon, Pune, Satara, Solapur, and Jalgaon markets were selected purposefully based on the volume of arrivals at the APMC markets in major onion-producing districts of Maharashtra.

Monthly time series data on the prices and arrivals of onion were used from January 2011 to December 2023.

*A. Analytical tools*

**(i) Growth Rate.** Compound growth rate is a key indicator to measure agricultural growth and can be used for forecasting the prices/arrivals of onion. It plays a vital role in agricultural policymaking, therefore, the estimated value of the growth rate needs to be very precise, so that suitable policies can be adapted accordingly. The accuracy of the estimated value of the growth rate largely depends on proper statistical procedures followed to estimate it.

A compound growth rate is simply a compounding of annual growth rates over a period. It can be easily computed using two data points with constant returns as in the case of fixed deposits. However, in the case of annual growth rates which are not constant, but for monotonically increasing or decreasing functions, the compound growth rate is computed based on its fit using non-linear models, especially, the exponential model. The exponential model is more commonly used in economic analysis. Conventionally, the compound growth rates were estimated after converting the growth model to semi-log form and estimated through the Ordinary Least Square (OLS) technique assuming multiplicative error term.

$$Y_t = b_0 * b_1^{\,t} * e_t \quad (1)$$

$$ln\,(Yt) = b_0 + t * \ln b_1 + e_t \quad (2)$$

Where,

***ln* (Yt)** is the natural logarithm of time series data for arrivals/prices for year t,

$\mathbf{b_0}$ is the constant term,

**t** is the time trend for years of interest,

$\mathbf{e_t}$ is the error term and

$\mathbf{b_1}$ is the growth rate for the period under consideration (*i.e.,* slope coefficient).

Then, the Compound growth rate was calculated using the following equation

$$\text{Compound Growth Rate} = [(\text{Antilog } b_1) - 1] * 100 \quad (3)$$

However, there are several problems associated with this methodology including the difficulty in estimating standard error of estimates of original parameters (Prajneshu & Chandran 2005). Hence, a non-linear estimation technique for solving the exponential model

assuming additive error terms was used to estimate the compound growth rates.

$$Y_t = \text{constant} * (1+CGR)^t + e_t \quad (4)$$

Where,

$\mathbf{Y_t}$ is the time series data for arrivals/prices for year t,

**t** is the time trends for years of interest,

$\mathbf{e_t}$ is the error term and

**CGR** is the compound growth rate for the period under consideration

The Marquardt algorithm was used to estimate the parameters of the equation (4). The significance of regression coefficient 'b' (slope coefficient) was tested by applying a standard 't' test procedure (Gujarati and Sangeetha 2007).

**Seasonality of prices and arrivals of onion.** The monthly data on wholesale prices and arrivals were used for determining the seasonal behaviour of prices and arrivals in the selected markets. To measure the seasonal variations in prices and arrivals, seasonal indices were calculated by employing the twelve-month ratio to moving average method. The seasonal indices were calculated by adopting the following steps,

**I step**, 12 months moving total were generated. These totals were divided by 12 to compute the 12-month moving average. Then a series of centered moving averages were worked out. For calculating the seasonal indices, 13 years of data were considered.

**II step**, original values were expressed as a percentage of corresponding centered moving averages. Further, the irregular component in the series was removed. Afterwards, these percentages were arranged in terms of monthly averages. Then the average index for each month was computed.

**III step**, these monthly average indices were adjusted in such a way that their sum becomes 1200. This can be done by working out a correction factor and multiplying the average for each month by this correction factor. The correction factor (K) is worked out as follows,

K = 1200/ S

Where,

K is a correction factor

S is the sum of average indices for 12 months

Multiply K with the percentage of moving average for each month to obtain the seasonal indices

**(ii) Price Volatility.** The measure that may be used to estimate instability in a variable over time should satisfy two minimum conditions. First, it should not include deviations in the data series that arise due to secular trends or growth. Second, it should be comparable across the data sets having different means (Mehra, 1981; Hazell, 1982). A simple coefficient of variation (CV) overestimates the level of instability in time series data, characterized by long-term trends. To avoid the problem of overestimation, Mehra (1981); Hazell (1982) have developed two independent methods of estimation of instability in the time series data. Both the methods involve detrending of the data series. However, both methods have been criticized for measuring instability around arbitrarily assumed trend lines, which greatly influences inference regarding changes in instability (Ray, 1983).

Ray (1983) has developed a very simple measure of using standard deviation in annual growth rates. This method satisfies all the ideal properties like instability based on de-trended data and comparability. Moreover, the methodology does not involve actual estimation of the trend, computation of residuals and de-trending, but all these are taken care in the standard deviation of annual growth rates. This method does not suffer from the limitations of arbitrary choice of assumed trend line which was present in the methods developed by Mehra (1981); Hazell (1982).

However, in recent years at the international level, the Cuddy-Della Valle Index was used as a measure of variability in time series data analysis (Weber and Sievers, 1985). Singh and Byerlee (1990) found identical results of instability when they estimated instability by the Cuddy-Della Valle Index and Coefficient of Variation around the trend as the standard error of regression divided by the mean. Since both methods provide similar results and possess all desirable properties, so we have estimated instability in arrivals and prices of onion using the Cuddy Della Valle Index for the present investigation.

This index is a modification of the coefficient of variation [CV] to accommodate trends, which is commonly present in time series economic data. It is superior over other scale-dependent measures such as Standard Deviation or Root Mean Square of the residuals (RMSE) obtained from the fitted trend lines of the raw data, and hence suitable for cross-comparisons (Cuddy and Della Valle 1978).

The Cuddy-Della Valle Index (Ix) was calculated as follows:

$$I_x = \frac{SEE}{\bar{Y}} * 100$$

Where,

$I_x$ = Instability index

SEE = Standard error of the trend line estimates

y = Average value of the time series data

Alternatively, Ix could be measured as:

$I_x = CV\sqrt{(1-R^2)}$

Where,

Coefficient of variation = SD/Mean*100

Standard deviation (SD)= $\sqrt{(x-\bar{x})^2/n}$

$R^2$ = Adjusted coefficient of multiple determination

Where ever trend in the time series data was non-significant, the instability of that particular series was analyzed with the help of a conventional statistical tool of instability *i.e.,* coefficient of variation.

## RESULTS AND DISCUSSION

**Growth rates of wholesale arrivals of onion in selected markets of Maharashtra.** The compound

annual growth rates of wholesale onion arrivals in selected markets of major onion-producing districts in Maharashtra are presented in Table 1. Growth rates are calculated for the period 2011 to 2023. The results revealed that arrivals of onion in the selected markets recorded significant compound growth rates which ranged from 0.56 to 10.82 per cent per annum. The growth rates of all markets are significant at a 5 per cent level of significance. The highest growth in prices was registered in the Solapur market (10.82 per cent), followed by Lasalgaon market (6.87 per cent), Jalgaon market (4.49 per cent), Pune market (0.84 percent) and Satara market (0.56 per cent). Similar results were observed by Daundkar *et al.* (2016) in Pune market who observed that growth rate of arrivals was positive and significant. Fig 1 shows the monthly onion arrivals in selected Maharashtra markets from 2011 to 2023, highlighting significant variability and overall positive growth trends. Lasalgaon and Solapur markets have the highest peaks, with Lasalgaon showing the most fluctuations, Pune and Satara markets exhibit moderate seasonal peaks and steady growth from 2015 onwards. Jalgaon, while having the lowest peaks, consistently increases arrivals over the years. Overall, the data reflects rising onion arrivals in these markets with strong seasonal and notable yearly variations.

**Growth rates of wholesale prices of onion in selected markets of Maharashtra.** Table 2 represents the compound annual growth rates of onion prices for the period 2011- 2023 in selected markets of Maharashtra. All markets witnessed positive growth with the highest growth in prices found in Solapur and Lasalgaon markets recording 0.32 and 0.31 per cent annual compound growth rates respectively. Growth rates in other selected markets *i.e.,* Pune, Satara, and Jalgaon markets were 0.18, 0.26, and 0.19 per cent per annum. Similar findings were reported by Navasare *et al.* (2018) who observed that growth rate of sorghum prices were positive and significant. Fig. 2 illustrates the monthly prices of onions in selected markets of Maharashtra from 2011 to 2023. Notably, 2019 and 2020 experienced the highest price peaks among the observed periods indicating periods of increased demand or reduced supply with, lower price peaks are evident in years such as 2012, 2016, and 2021 suggesting periods of increased supply or decreased demand. The overall trend shows fluctuations in onion prices with higher peaks followed by periods of lower prices, indicating the volatility and strong seasonality of onion prices across these markets.

**Table 1: Compound growth rate of Onion arrivals in Major APMC markets of Maharashtra.**

| Sr. No. | Name of the Market | Intercept (a) | CAGR (%) | SE | $R^2$ |
|---|---|---|---|---|---|
| 1. | APMC Lasalgaon | 2079680 | 6.87 | 1.20 | 0.75 |
| 2. | APMC Pune | 3030468 | 0.84 | 0.81 | 0.09 |
| 3. | APMC Satara | 44692.78 | 0.56 | 0.88 | 0.03 |
| 4. | APMC Solapur | 1584925 | 10.82 | 1.69 | 0.84 |
| 5. | APMC Jalgaon | 104207.7 | 4.49 | 2.41 | 0.20 |

**Table 2: Compound growth rate of Onion Prices in Major APMC markets of Maharashtra.**

| Sr. No. | Name of the Market | Intercept (a) | CAGR (Percent) | SE | $R^2$ |
|---|---|---|---|---|---|
| 1. | APMC Lasalgaon | 1124.091 | 0.31 | 0.10 | 0.05 |
| 2. | APMC Pune | 1139.926 | 0.18 | 0.10 | 0.02 |
| 3. | APMC Satara | 1142.251 | 0.26 | 0.10 | 0.04 |
| 4. | APMC Solapur | 819.0009 | 0.32 | 0.10 | 0.06 |
| 5. | APMC Jalgaon | 934.1436 | 0.19 | 0.10 | 0.02 |

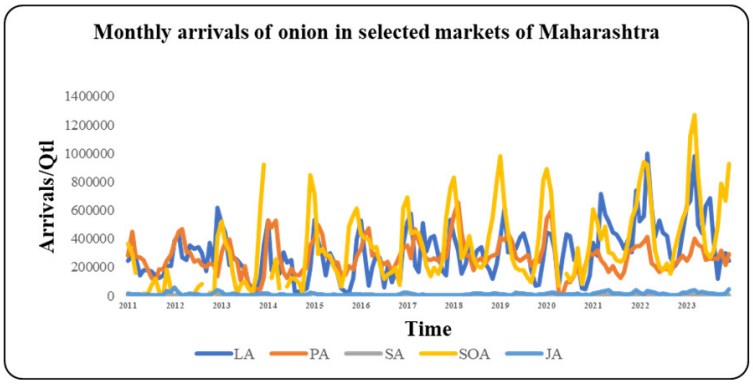


**Fig. 1.** Time sequence plot of arrivals of onion in selected markets of Maharashtra.

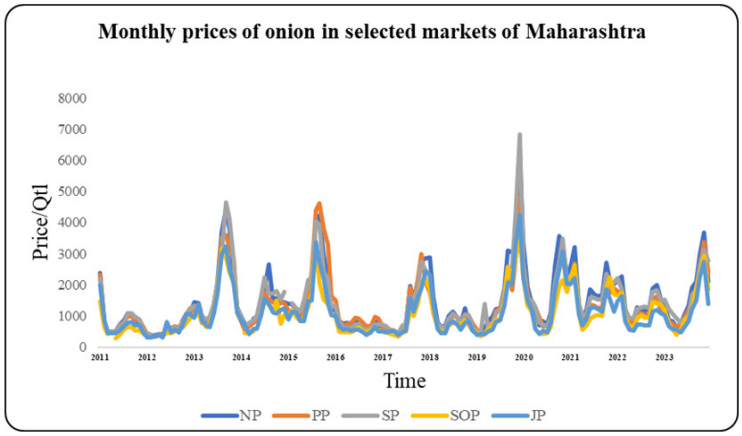


**Fig. 2.** Time sequence plot of monthly prices of onion in selected markets in Maharashtra.

**Seasonal indices of market arrivals of onion in selected markets of Maharashtra.** Seasonal indices for arrivals and prices have been estimated using 12-month moving averages to determine the long-term seasonal variations of onion arrivals and prices in the specified markets. The seasonal indices of monthly market arrivals of onion in selected markets are presented in Table 3.

The monthly market arrivals results revealed that in the Lasalgaon market, January recorded the highest arrivals with an index of 171.65, while October had the lowest at 46.60. In the Pune market, the highest index was in February at 158.91 and the lowest in September at 66.34. In the Satara market, March has the highest index at 164.17, with September the lowest at 58.10. In the Solapur market, the highest arrivals are in December with an index of 204.47 and the lowest in September at 47.51. Lastly, Jalgaon's peak is in December at 166.52, with the lowest in September at 56.35. Similar results were reported by Saha *et al.* (2020) in onion who identified that arrivals were higher during peak harvesting season. The seasonal indices of all markets are displayed in Fig. 3, exhibiting the strong seasonality pattern of all markets, featuring higher arrivals in December and January. As well as it's lower in September and October.

**Seasonal indices of market prices of onion in selected markets of Maharashtra.** The seasonal indices of monthly market prices of onion in selected markets are presented in Table 4. The monthly market prices results revealed that in the Lasalgaon market, the highest market prices were found in November with seasonal market price indices of 145.15 respectively. The lowest monthly market price indices were found in April, with 57.18 respectively. In the Pune market, the highest price indices were in November with seasonal market price indices of 149.91 respectively. The lowest monthly market price indices were found in April, with 57.34 respectively.

**Table 3: Seasonal indices of market arrivals of onion in selected markets of Maharashtra.**

| MONTH | n LASALGAON | PUNE | SATARA | SOLAPUR | JALGAON |
|---|---|---|---|---|---|
| January | 171.65 | 146.07 | 107.12 | 171.69 | 155.67 |
| February | 142.62 | 158.91 | 144.01 | 141.09 | 98.61 |
| March | 105.60 | 157.34 | 164.17 | 123.74 | 104.94 |
| April | 88.13 | 100.22 | 141.52 | 85.75 | 90.23 |
| May | 121.24 | 86.309 | 118.98 | 56.91 | 117.11 |
| June | 115.10 | 71.52 | 90.91 | 52.55 | 90.39 |
| July | 103.31 | 75.77 | 61.94 | 51.88 | 77.15 |
| August | 78.93 | 66.52 | 59.35 | 57.74 | 60.28 |
| September | 53.36 | 66.34 | 58.10 | 47.51 | 56.35 |
| October | 46.60 | 76.76 | 65.76 | 58.08 | 61.11 |
| November | 48.25 | 85.02 | 85.85 | 148.53 | 121.58 |
| December | 125.15 | 109.17 | 102.22 | 204.47 | 166.52 |

**Table 4: Seasonal indices of market prices of onion in selected markets of Maharashtra.**

| MONTH | LASALGAON | PUNE | SATARA | SOLAPUR | JALGAON |
|---|---|---|---|---|---|
| January | 106.53 | 99.89 | 97.67 | 101.44 | 106.33 |
| February | 87.08 | 82.02 | 84.73 | 87.77 | 94.89 |
| March | 60.35 | 61.07 | 72.96 | 61.36 | 67.26 |
| April | 57.18 | 57.34 | 59.58 | 58.88 | 58.02 |
| May | 60.85 | 60.52 | 59.78 | 43.34 | 54.31 |
| June | 80.49 | 82.38 | 81.59 | 83.86 | 82.37 |
| July | 93.55 | 95.41 | 95.08 | 100.66 | 91.14 |
| August | 127.25 | 122.96 | 115.33 | 129.00 | 120.90 |
| September | 127.59 | 126.48 | 127.48 | 117.70 | 119.44 |
| October | 145.15 | 137.41 | 136.25 | 139.64 | 134.03 |
| November | 134.73 | 149.91 | 143.00 | 143.72 | 144.93 |
| December | 119.19 | 124.55 | 126.49 | 132.57 | 126.33 |

In Satara, the highest price indices were in November with seasonal market price indices of 143. The lowest monthly market price indices were found in April, with 59.58 respectively. In Solapur, the highest price indices were in November with seasonal market price indices of 143.72 respectively. The lowest monthly market price indices were found in May, with 43.34 respectively. In Jalgaon, the highest price indices were in November with seasonal market price indices of 144.93 respectively. The lowest monthly market price indices were found in May, with 54.31 respectively. All the markets experience higher prices in October and November, while prices tend to be lower in April and May. These results were collaborated with the findings of Rohith and Nabhay (2024), Who observed that fluctuations were more from August to January in onion. Fig. 4 revealed that in all the markets onion prices rise from June and continue to increase until November, after which they start to fall.

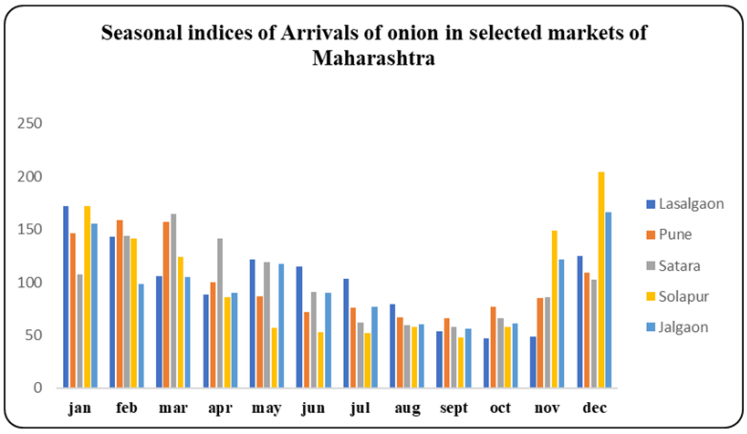


**Fig. 3.** Seasonal indices of Arrivals of onion in selected markets of Maharashtra.

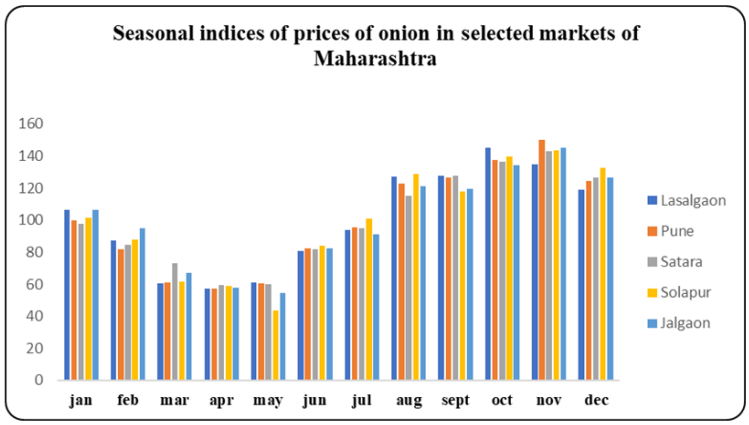


**Fig. 4.** Seasonal indices of prices of onion in selected markets of Maharashtra.

**Price volatility in prices of onion in selected markets.** To assess the price volatility of onions in selected markets, a systematic approach was followed. The process began with the coefficient of variation (CV) to assess relative price volatility. Then, the Cuddy-Della Valle Index (CDVI) was used to adjust for trends in the CV. The results are presented in Table 6. The analysis of onion price instability in major markets of Maharashtra *i.e.,* Lasalgaon, Pune, Satara, Solapur,

and Jalgaon reveals significant differences in price volatility and trends.

Lasalgaon shows the highest price instability, with a Coefficient of Variation (CV) of 68.395 and a Cuddy-Della Valle Index (CDVI) of 66.740, indicating significant price variability. Pune and Satara follow, with CVs of 66.102 and 67.644, and CDVIs of 65.437 and 66.398, respectively. Jalgaon also shows high instability, with a CV of 67.116, and a CDVI of 66.480. Solapur stands out with the lowest instability, having a CV of 63.726, and a CDVI of 62.434, indicating relatively stable prices. By observing the CDVI indices we can comprehend that all the five markets are highly volatile since there range is above 30. These are similar to the results presented by Guleria *et al*. (2022) in Tomato, who observed that maximum instability in tomato prices in May.

For a better understanding of the variability of arrivals of onion analysis of C.V and CDVI was carried out in major markets of Maharashtra, as shown in Table 5, which reveals that the Lasalgaon market exhibits the high instability with a CV of 35.919 and a CDVI of 24.469, indicating significant volatility in arrivals. Solapur market shows a CV of 49.647 and a CDVI of 26.020, suggesting the highest degree of fluctuation adjusted for trends. The Jalgaon market also follows substantial instability with a CV of 44.430 and a CDVI of 39.569. In contrast, the Pune market has the lowest instability with both CV and CDVI at 15.402, indicating relatively stable arrivals. Satara market experiences moderate variability with a CV of 19.742 and a CDVI of 19.484. These findings are aligned with results of Kumar *et al*. (2023) in chilli who identified that onion and tomato exhibited high instability among vegetables.

Variability calculated with the help of Cuddy Della-Valle Index revealed that variability in both arrival and prices were on the higher side but variability in price was more than that of arrival. This may be because onion price was subjected to high volatility Saha *et al.* (2020).

**Table 5: Instability in arrivals of onion in selected markets of Maharashtra.**

| Sr. No. | Markets | Coefficient of Variation (Per cent) | CDVI (Per cent) |
|---|---|---|---|
| 1. | Lasalgaon | 35.919 | 24.469 |
| 2. | Pune | 15.402 | 15.402 |
| 3. | Satara | 19.742 | 19.484 |
| 4. | Solapur | 49.647 | 26.020 |
| 5. | Jalgaon | 44.430 | 39.569 |

**Table 6: Instability in prices of onion in selected markets of Maharashtra.**

| Sr. No. | Markets | Coefficient of Variation (Per cent) | CDVI (Per cent) |
|---|---|---|---|
| 1. | Lasalgaon | 68.395 | 66.740 |
| 2. | Pune | 66.102 | 65.437 |
| 3. | Satara | 67.644 | 66.398 |
| 4. | Solapur | 63.726 | 62.434 |
| 5. | Jalgaon | 67.116 | 66.480 |

## CONCLUSIONS

The Compound Annual growth rate of onion prices and arrivals revealed that all the selected markets had shown positive growth. Arrivals of onion in selected markets were high during (December to March) and the lowest arrivals generally in September or October. Prices of selected onion markets started increasing in June, reaching a peak in November and dropping in April or May. Prices of all the markets had shown highly volatile which is CDVI above 30% in which the Lasalgaon market exhibited the highest volatility.

## FUTURE SCOPE

The onion production is limited to a few regions in the State and is seasonal. In addition to being consumed year-round throughout the State, this crop is also exported to markets outside the State. This has led to an increase in the number of middlemen in the marketing chain, higher transportation costs, and higher marketing costs. Onion prices also fluctuate seasonally and uniquely. The degree of change is determined by factors such as supply, peak arrival times, transportation failures, etc., which causes significant difficulty for both producers and consumers. Thus, improving operational and pricing efficiencies in marketing is crucial to guaranteeing producers favorable prices and, as a result, more production. The purpose of this investigation is to study the growth rate of time arrivals and prices and to forecast the onion price by using the data of the last decade. This study will help us to study the extent to which price changes in one market affect the prices of the other market. This study will help in developing effective strategies to deal with volatility and its effects by giving a clear picture of the degree of volatility at the market level and how it moves over.

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**Conflict of Interest.** None.

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