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Analyzing Price Behaviour and Constraints in Marketing of Small Onion in Tamil Nadu, India

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Authors' contributions

This work was carried out in collaboration among all authors. Author DD was responsible for designing the study, conducting the statistical analysis, developing the protocol, and drafting the initial manuscript. Author PR contributed by revising and editing the manuscript, while Author SKM managed the analyses of the study. Author RA handled the literature searches, and authors KM and PM provided statistical expertise. All authors read and approved the final manuscript.

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ABSTRACT

This study examines market trends and seasonal patterns in small onion Markets in Tamil Nadu, while also investigating challenges faced by various stakeholders in the onion supply chain. The various analyses have made use of secondary data that has been gathered from different sources. The NHRDF office in Coimbatore, NHB website and AGMARKNET website are the sources of the monthly data on wholesale market prices and arrivals of small onions f markets of Dindigul, Chennai, Coimbatore and Idukki from 2014 to 2023. Primary data also obtained to fulfill the one of the research objectives by surveying the sample of respondents. Two districts were selected purposefully: Perambalur and Trichy districts, based on the top onion producing districts in Tamil Nadu. The sample size constitutes 180 respondents (80 farmers, 40 retailers, 20 wholesalers and 40 consumers) were randomly interviewed with help of pre structured interview schedule. Trend analysis revealed increasing price trends across all markets, with Idukki experiencing the highest rate of increase. Seasonal index analysis indicated that prices in Tamil Nadu markets are influenced by arrivals, with lower prices during peak arrival periods., while Idukki market in Kerala prices less influenced by arrivals. Farmers struggle primarily with high labor costs (78%) and high cost of fertilizers pesticides and machineries (68.7%), while consumers face problems with price fluctuations (68.8%) and quality concerns (68.6%), retailers face problems with lack of storage facilities (76.27%) and absence of facilities for grading (64.85%), and wholesalers struggle with financial risks (79.2%). The study's findings will aid policymakers to focus on improving market infrastructure, regulating intermediaries, and supporting farmers in managing costs. Leveraging existing labor schemes could help alleviate workforce shortages. Furthermore, customers would gain from initiatives to maintain price stability and raise quality standards.

Keywords: Onion; price and arrivals; trends and seasonal variations; price fluctuations; price volatility.

1. INTRODUCTION

Onion is also referred to as the King of the Kitchen. Onion is practically an essential part of Indian cuisine. In 2022, India is in first place in the global production of onions; it produces 316.87 lakh tons. India occupies first place in the export of onion to the other countries, exporting around 21.21 lakh tons [1]. In India, Maharashtra occupies first place with a 42.5% share in the production of onions in India. Approximately 75% of onions grown in Tamil Nadu are small onions, with a productivity of 12 tons per hectare [2]. Perambalur, Trichy, Namakkal, Trippur, Dindigul, Coimbatore, and Tenkasi are the major small onion-producing districts in Tamil Nadu [2,3], these production markets onions are transported to other districts like Chennai, Pudukottai, Cuddalore, Nagapattinam, Thanjavur, and some other districts. And also transport to the other states like Kerala, Karnataka, and Andhra Pradesh. The major export destinations are Sri Lanka, Singapore, and Malaysia.

With the high demand for onions, the price is high, but the farmers are getting less profit due to low production with the effect of climate change, pest attacks and diseases. These unpredictable climatic conditions and pest attacks and diseases will reduce the yields, it will affect both the supply and the income of farmers [4]. Farmers are facing problems with rising input costs such as fertilizers and pesticides. The increasing prices of these inputs can significantly impact the profitability of onion farming, reducing the profit of the farmers [1]. Onion farming requires a substantial workforce for planting, weeding, harvesting, and post-harvest processing. The increasing cost of labor, due to urban migration and labor shortages in rural areas, adds to the financial burden on farmers [5]. Inadequate storage facilities, poor handling practices, and restricted market access are the main causes of post-harvest losses in onions, which result in severe spoiling and decreased market value [6]. Due to price manipulation, late payments, a lack of transparency in transactions, and farmer exploitation, intermediaries drive onion growers through financial stress and unfair prices [7].

Keeping in view, present study was conducted with the objective of

1. To analyze the trends in the selected markets of small onion markets in Tamil Nadu.
2. To identify the constraints faced by stakeholders in marketing of small onion and to suggest suitable measures.

2. MATERIALS AND METHODS

The various analyses have made use of secondary data that has been gathered from different sources. The NHRDF office in Coimbatore and NHB website are the sources of the monthly data on market arrivals and prices of small onion markets of Dindigul, Chennai, and Coimbatore from 2014 to 2023. Since Tamil Nadu is the major source of small onions for Kerala, the Idukki market in Kerala was chosen for this study in order to compare it to the Tamil Nadu market. AGMARKNET is the source of the monthly data on market arrivals and prices of small onion markets in Idukki. Primary data was also obtained to fulfill the research objective through surveying the sample of respondents. Perambalur and Trichy districts were selected purposefully, based on the top-producing districts in Tamil Nadu [2,3]. In these districts, 4 blocks are selected purposefully, 2 blocks from each district. Thuraiyur and Thathaiengarpettai blocks from Trichy district and Perambalur and Alathur blocks from Perambalur districts, these blocks are selected based on the top producing blocks in the districts [8]. From each block, 20 farmers, 10 retailers, 5 wholesalers and 10 consumers were randomly interviewed. In agricultural markets, it's common to find more retailers than wholesalers. Retailers typically operate in larger numbers because they serve the end consumers directly and are spread out in smaller quantities across various locations. These are the reasons for the different proportions of wholesalers and retailers sampled. The total sample size constitutes 180 respondents (80 farmers, 40 retailers, 20 wholesalers and 40 consumers) were randomly interviewed with the help of a pre-structured interview schedule.

2.1 Trend Analysis

Time series are likely to have an increasing or decreasing tendency over extended periods of time. The trend shape could be either linear or non-linear. We were able to compute the time series elements trend using with the help of the structured mathematical model. For shorter periods, a linear relationship provides a good description of the trend; for longer periods, a non-linear relationship does the same. The population is growing, technology is producing more, and people's preferences are changing, which is why the time series is changing. The ordinary least square method has been used to calculate the trend in prices and arrivals of major onion markets by estimating the intercept (a) and slope coefficient (b) in the following linear functional form

$$Y_t = a + bX_t + e_t$$

Where,

Y_t = trend value at time
X_t = monthly prices or arrivals of onion at time t in the selected market
e_t = random disturbance term
a = intercept parameter
b = slope parameter

The significance of the regression coefficient was tested using the student's 't' test [9].

2.2 Seasonal Index

Using the following procedure [10], 12-month moving averages for the monthly arrival and price data were first computed to estimate the seasonal index.

M1 = (Y1+Y2+ Y3+.....+ Y12)/12
M2 = (Y2+Y3+Y4+.....+ Y13)/12

M1, M2....Mi is the centered moving averages
Y1, Y2.... Yn is the monthly arrivals or prices

The centered moving average is used for dividing the original series. The first estimate of the seasonal components (ST). There is no moving average for the first and last six months. obtained values were arranged month-wise for each year. The average value of each month was calculated by adjusting their total to 1200 or averaged to 100. The seasonal index of each month is estimated and adjusted using the correction factor.

Adjusted Seasonal indices = Seasonal indices x correction factor

Correction factor = 1200 / Sum of seasonal indices

2.3 Garrett Ranking Technique

Garrett's ranking technique was used to rank the preference indicated by the respondents on different factors. According to this method, participants were asked to rank each element, and the results of that ranking were then translated into a score value using the formula below:

$$\text{Percent position} = \frac{100\ (Rij - 0.5)}{Nj}$$

Where

Rij = Rank given for the i^{th} variable by j^{th} respondents
Nj = Number of variables ranked by j^{th} respondents

The percent position estimate is translated into scores using Garrett's Table. Following the addition of each person's score for each factor, the total value of the scores and the mean values of the scores are determined. The factor having the highest mean value is considered to be the most important factor [11].

3. RESULTS AND DISCUSSION

3.1 Trend Analysis

A trend indicates the way that prices and arrivals have changed over a given period of time. Table 1, indicates all four markets prices show positive and significant at the 1 percent level, and all the markets prices shows increasing trends, which indicates all the market demand has increased over the years. Idukki market in Kerala indicate the highest rate of price increase compared to Tamil Nadu markets of Dindigul, Chennai, and Coimbatore. Dindigul market shows the lowest rate of price increase because of the production market. The remaining markets of Coimbatore, Chennai, and Idukki are consumption markets, which show prices higher than the Dindigul production market. Dindigul, Chennai, and Coimbatore markets in Tamil Nadu shows the negative coefficient indicating a decreasing trend in arrivals, showing a reduction in arrivals over time. In the Idukki market in Kerala, a positive coefficient indicates an increasing trend in arrivals, showing an increase in arrivals over time.

3.2 Seasonal Index

Small onion is grown mostly in rabi season in Tamil Nadu. In all three markets, Dindigul, Chennai, and Coimbatore, prices were lower during March-April, and also arrivals were high. This indicates that during peak arrivals the prices are low. Fig. 1. indicates the price and arrival trends are in the opposite direction; it shows that during peak arrivals, prices are low and during the low arrivals, the prices are high, hence in Tamil Nadu markets prices are influenced by arrivals. In Idukki market in Kerala, prices are low in March because mostly Kerala markets get small onions from the Tamil Nadu markets, so the prices are the similar compared to Tamil Nadu. But peal arrivals in Idukki markets occurred during September and January, so in Idukki markets prices were not influenced by the arrivals. Hence, all the markets in Tamil Nadu prices and arrivals followed a similar pattern.

3.3 Constraints Faced by Stakeholders in Marketing of small Onion

3.3.1 Constraints faced by onion farmers

Table 2, represents the constraints faced by onion farmers. 80 farmers are sampled for this study. Using the Garrett score, the highest priority is the 1st rank. The most significant barrier, ranked first with a mean score of 78, is the high cost of labor. Most of the farmers faced problems because of the high cost of labor. More labor is needed for removing onion leaves from onion, and land preparation, planting, weeding, etc., especially for removing onion leaves from onion; it will cost Rs 4-5/kg. Second is the high cost of fertilizers, pesticides, and machinery, with a mean score of 68.7. Third is exploitation by middlemen, with a mean score of 60. Middlemen buy onions from farmers at low prices and sell them to the wholesaler at a high price; they won't show their bills to the farmers. Fourth is an attack of pests and diseases with a mean score of 54.7, fifth is natural calamities with a mean score of 53, sixth is inadequate availability of machinery with a mean score of 44.5, seventh is inadequate funds with a mean score of 38.1, eighth is government regulations with a mean score of 30.3, ninth is crop loss by animals mean score of 22.3, and tenth is high transportation cost mean score of 18.1. Hence these are the problems faced by the onion farmers in Tamil Nadu.

Farmers faced challenges in Nashik district of Maharashtra state in production and marketing due to labor scarcity during peak hours and price fluctuations, as indicated by Garrett's scores of 81.06 and 79.83, respectively [12]. The major problems faced by the onion farmers in Nuh district of Haryana, were observed high cost of pesticides (93.33%), lack of knowledge about recommended fertilizer doses (86.67%), and high cost of fertilizer (83.33%) [13].

3.3.2 Problems faced by consumers when purchasing of onions

Table 3, represents the constraints faced by consumers when purchasing of onions. 40

consumers are selected for this study. Using the Garrett score, the highest priority is the 1st rank. The most significant barrier, ranked first with a mean score of 68.8, is that onion prices have high fluctuations; this indicates that consumers find it challenging to predict onion prices, which makes it challenging to plan their household budgets. Second is quality, which has a mean score of 68.6, third is high transportation cost, with a mean score of 61.1 and fourth is unavailability of onions, with a mean score of 57.6.

Price changes are the biggest issue for customers. 84.20 percent of the respondents agreed in Khost Province, Afghanistan [14].

3.3.3 Constraints faced by retailers

Table 4, represents the constraints faced by retailers while selling onions. 40 retailers are selected for this study. Using the Garrett score, the highest priority is the 1st rank. The most significant barrier, ranked first with a mean score of 76.27, is the lack of storage facilities; second absence of facilities for grading onions means with a mean score of 64.85; third high cost incurred in labor has a mean score of 57.4; fourth is high cost of transportation with a mean score of 56.5; fifth is price fluctuations with a mean score of 50; and sixth is government interventions with a mean score of 45.2.

3.3.4 Constraints faced by onion wholesalers

Table 5, represents the constraints faced by onion wholesalers while marketing of onion. 20 wholesalers are selected for this study. Using Garrett's score, the highest priority is the 1st rank. The most significant barrier ranked first with a mean score of 79.2, is financial risk,

Table 1. Trend analysis of prices and arrivals in the selected markets (2014-2023)

Markets	Prices		Arrivals	
	Intercept	Coefficient	Intercept	Coefficient
Dindigul	2193.438*	18.392*	2031.524*	-0.885
Chennai	2457.021*	20.743*	1962.542*	-0.875
Coimbatore	2344.228*	20.352*	1709.066*	-0.868
Idukki	3225.077*	24.766*	286.412*	2.339*

**Significance at 1 percent level*

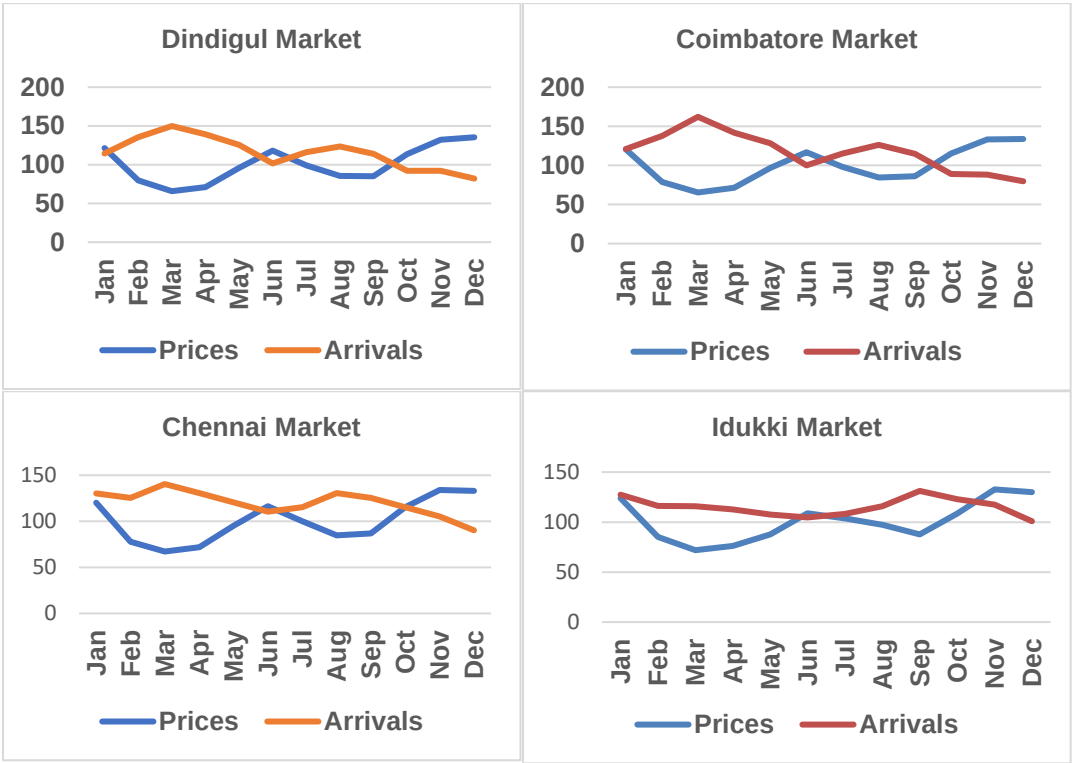

Fig. 1. Seasonal index for prices and arrivals of selected markets (2014-2023)

Table 2. Constraints faced by onion farmers

S.NO	Constraints	Mean score value	Rank
1	Government regulations	30.3	VIII
2	Crop loss by animals	22.3	IX
3	Inadequate fund	38.1	VII
4	Natural calamities	53	V
5	Exploitation by middleman	60	III
6	Attack of pests and diseases	54.7	IV
7	Inadequate availability of machinery	44.5	VI
8	High cost of labor	78	I
9	High price of fertilizers, pesticides and machinery	68.7	II
10	High transportation cost	18.1	X

Table 3. Constraints faced by onion consumers

S.NO	Constraints	Mean score value	Rank
1	Quality is not good	68.6	II
2	Onion price is high fluctuations	68.8	I
3	Non availability of onion	57.6	IV
4	High transportation cost	61.1	III

Table 4. Constraints faced by retailers

S.NO	Constraints	Mean score value	Rank
1	High cost incurred in labor	57.4	III
2	High cost of transportation	56.5	IV
3	lack of storage facilities	76.27	I
4	Absence of facilities for grading onions	64.85	II
5	Price fluctuations	50	V
6	Government interventions	45.2	VI

Table 5. Constraints faced by wholesalers

S.NO	Constraints	Mean score value	Rank
1	Storage issues	61.4	III
2	Absence of facilities for grading onions	63	II
3	Financial risk	79.2	I
4	Government regulations	51.5	V
5	Transportation cost	55.1	IV

while giving advance money to the farmers and pending money from buyers. Second, is the absence of facilities for grading onions with a mean score of 63; third is Storage issues with a mean score of 61.4; fourth is high transportation cost with a mean score of 55.1; and fifth is government regulations with a mean score of 51.5.

The major constraints faced by wholesalers in Khost Province, Afghanistan, was the absence of facilities for grading onions (60.70) [13,15-17].

4. CONCLUSION

This study examined trends in selected small onion markets in Tamil Nadu. and also selected the Idukki market in Kerala for comparison with Tamil Nadu markets. along with the challenges faced by various stakeholders in the onion supply chain. The trend analysis revealed that increasing price trends across all the markets, with the Idukki market in Kerala showing the highest rate of increase. Seasonal index analysis indicated that prices in Tamil Nadu markets are influenced by arrivals, with lower prices during peak arrival periods. Farmers face various problems, primarily high labor costs and increasing input prices. Consumers struggle with price fluctuations and quality issues, while retailers grapple with a lack of storage facilities and grading infrastructure. Wholesalers face problems in financial risks.

5. IMPLICATIONS FOR PRACTICE AND POLICY

To address these issues, policy interventions should focus on enhancing grading and storage facilities, regulating market intermediaries, and helping farmers manage input costs. To address these problems utilizing MGNREGA workers for the production and harvesting of onions, it will reduce the stress on labor availability and labor cost to the farmers like removing onion leaves from onions, etc. Furthermore, customers would gain from initiatives to maintain price stability and raise quality standards. Implementing these strategies could lead to a more efficient and equitable small onion markets in Tamil Nadu.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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