

ANALYSIS OF LETTUCE PRICES IN TÜRKİYE: SEASONAL FLUCTUATIONS

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Abstract

This study analyzed changes in lettuce prices and seasonal fluctuations in Türkiye. In addition, the development of lettuce production in the world and Türkiye was determined. In this study, world lettuce production data cover the period 2000-2022 and Türkiye lettuce production data cover the period 2000-2023. The Lettuce price data cover the period 2010-2023. Türkiye ranks 8th in the world in terms of lettuce production and 30th in terms of lettuce exports. In 2023, 26.61% of the total lettuce production in Türkiye was achieved in greenhouses and 73.39% in open fields. In this study, seasonal index values of lettuce prices were calculated and compared in three ways: simple average, moving average, and trend analysis. According to all three methods, lettuce prices increased in August and September and decreased in May and June. It was determined that there are seasonal fluctuations in lettuce prices throughout the year. Based on the results of the research, August and September were determined to be the most profitable production periods for lettuce producers. If producers can adjust their production planning according to these months, their earnings will increase.

Key words: vegetables, lettuce prices, price analysis, seasonal fluctuations, Türkiye

INTRODUCTION

The vegetable sector is an important sub-sector of agriculture in terms of being directly related to nutrition, providing raw materials to the vegetable processing industry, and contributing to the country's economy through foreign trade [1].

Lettuce production in Türkiye takes place in greenhouses and open fields. Of the 577,773 tons of lettuce produced in 2023, 26.61% was produced in greenhouses and 73.39% was produced in open fields. The total greenhouse vegetable production in Türkiye is approximately 8 million tons, of which 1.93 percent is lettuce production. Vegetable production in the field is 23.81 million tons, of which 5.31% is lettuce [9].

Türkiye ranks 8th in the world in lettuce production [6] and 30th in exports [7]. Revealing seasonal fluctuations in lettuce prices is important for producers, consumers, and exporters.

There is no specific policy on support for fresh vegetable production in Türkiye. Therefore, farmers make their production

decisions based on their past experiences and the price of the product in the market during the previous period. The market price intensifies during certain periods of the year. If these fluctuations in prices are upward, consumers suffer, and if they are downward, producers suffer.

Farmers' production decisions, market conditions, specific agricultural characteristics, and fluctuations in product supply are the main factors affecting agricultural product prices [8].

In this study, seasonal fluctuations in lettuce prices—an important product for producers and consumers—are analyzed. The reasons for price fluctuations are revealed, and recommendations are developed.

MATERIALS AND METHODS

The data constituting the main material of the study were obtained from the statistical records of the Food and Agriculture Organization of the United Nations (FAO) and Antalya Fruit and Vegetable Wholesale Market. The development of lettuce

production in the world and major lettuce-producing countries between 2000 and 2022 was analyzed. The development of lettuce production in Türkiye between 2000 and 2023 was evaluated. These data were analyzed using simple and chain index ratios. Simple ratio, moving ratio, and trend ratio methods were used to calculate seasonal fluctuations in lettuce prices [5]. Lettuce prices used in this study were converted to real prices using the Producer Price Index (PPI) calculated by the Turkish Statistical Institute (TURKSTAT) [10]. Changes in annual and monthly lettuce prices and their causes were investigated.

RESULTS AND DISCUSSIONS

Development of lettuce production in the world

Development of lettuce production

The world lettuce cultivation area varies between 936 thousand hectares and 1 million 244 thousand hectares between 2000 and

2022. The Lettuce cultivation area, which was 936 thousand hectares in 2000-2004, increased by 32.45% to 1 million 239 thousand hectares in 2022. When the change in production areas compared with the previous period is analyzed, the highest increase was realized in the average of 2005-2009 with 16.84%. As of the same date, global lettuce production has varied between 20.3 million tons and 27.8 million tons. Lettuce production, which was 20 million 303 thousand tons in 2000-2004, increased by 33.72% and reached 27 million 149 thousand tons in 2022. When the change in production compared with the previous period is analyzed, the highest increase was achieved in 2020 (37.10%). While the world lettuce yield was 21 696 kg per hectare in 2000-2004, it increased by 0.96% to 21 904 kg per hectare in 2022 (Table 1). The production of lettuce has also increased due to the increase in global cultivation areas. However, there was no change in world lettuce yield.

Table 1. Development of lettuce production in the world

| Years | 1,000 Hectare | A Index* | B Index** | 1,000 Tons | A Index* | B Index** | kg/ha | A Index* | B Index** |
|-----------|---------------|----------|-----------|------------|----------|-----------|--------|----------|-----------|
| 2000-2004 | 936 | 100.00 | | 20,303 | 100.00 | | 21,696 | 100.00 | |
| 2005-2009 | 1,093 | 116.84 | 116.84 | 23,590 | 116.18 | 116.18 | 21,577 | 99.45 | 99.45 |
| 2010-2014 | 1,154 | 123.34 | 105.56 | 25,064 | 123.45 | 106.25 | 21,716 | 100.09 | 100.64 |
| 2015-2019 | 1,228 | 131.21 | 106.38 | 26,838 | 132.18 | 107.08 | 21,857 | 100.74 | 100.65 |
| 2020 | 1,239 | 132.42 | 100.93 | 27,836 | 137.10 | 103.72 | 22,464 | 103.54 | 102.77 |
| 2021 | 1,244 | 132.91 | 100.37 | 27,236 | 134.15 | 97.85 | 21,899 | 100.93 | 97.48 |
| 2022 | 1,239 | 132.45 | 99.66 | 27,149 | 133.72 | 99.68 | 21,904 | 100.96 | 100.02 |

*(Average of 2000-2004=100), **(Previous year=100)

Source: [2].

Table 2. Development of lettuce production in the world's leading producers

| Years | China | USA | India | Spain | Italy | Belgium | Japan | Türkiye | Other countries | World |
|-----------|------------|-------|-------|-------|-------|---------|-------|---------|-----------------|--------|
| | 1,000 Tons | | | | | | | | | |
| 2000-2004 | 8,870 | 4,553 | 807 | 1,028 | 946 | 89 | 542 | 349 | 3,121 | 20,303 |
| 2005-2009 | 11,990 | 4,260 | 936 | 957 | 940 | 75 | 547 | 434 | 3,451 | 23,590 |
| 2010-2014 | 13,562 | 3,994 | 1,064 | 872 | 758 | 58 | 561 | 430 | 3,763 | 25,064 |
| 2015-2019 | 14,549 | 4,070 | 1,143 | 956 | 725 | 238 | 580 | 481 | 4,094 | 26,838 |
| 2020 | 15,121 | 3,828 | 1,151 | 969 | 735 | 539 | 564 | 520 | 4,408 | 27,836 |
| 2021 | 14,851 | 3,395 | 1,157 | 1,066 | 704 | 565 | 547 | 541 | 4,410 | 27,236 |
| 2022 | 14,978 | 3,299 | 1,161 | 969 | 638 | 601 | 563 | 562 | 4,378 | 27,149 |
| | % | | | | | | | | | |
| 2000-2004 | 43.69 | 22.42 | 3.97 | 5.06 | 4.66 | 0.44 | 2.67 | 1.72 | 15.37 | 100.00 |
| 2005-2009 | 50.83 | 18.06 | 3.97 | 4.06 | 3.98 | 0.32 | 2.32 | 1.84 | 14.63 | 100.00 |
| 2010-2014 | 54.11 | 15.94 | 4.25 | 3.48 | 3.02 | 0.23 | 2.24 | 1.72 | 15.02 | 100.00 |
| 2015-2019 | 54.21 | 15.17 | 4.26 | 3.56 | 2.70 | 0.89 | 2.16 | 1.79 | 15.25 | 100.00 |
| 2020 | 54.32 | 13.75 | 4.14 | 3.48 | 2.64 | 1.94 | 2.03 | 1.87 | 15.84 | 100.00 |
| 2021 | 54.53 | 12.47 | 4.25 | 3.91 | 2.58 | 2.07 | 2.01 | 1.98 | 16.19 | 100.00 |
| 2022 | 55.17 | 12.15 | 4.28 | 3.57 | 2.35 | 2.21 | 2.07 | 2.07 | 16.12 | 100.00 |

Source: [2].

In terms of world lettuce production, China ranks first with a share of 55.17%. China is followed by the United States with a share of 12.15% and India with a share of 4.28%. The total share of these three countries is 71.6%. It was determined that China's share in the world lettuce production increased and that of the USA decreased in the years analyzed. Türkiye's share varies between 1.72-2.07 (Table 2).

The Lettuce cultivation area in Türkiye increased by 4.48% from an average of 2 073

hectares in 2000-2004 to 2,165 hectares in 2023. In 2023, it was 2.5% higher than in the previous year. The amount of lettuce production varied between 349 thousand tons and 577 thousand tons in the years examined. Lettuce production, which was 349 thousand tons in 2000-2004, increased by 65.55% to 577 thousand 773 tons in 2023. In the same period, lettuce yield increased by 58.5% from 16,834 kg/ha to 26,682 kg/ha (Table 3). In Türkiye, lettuce cultivation areas are flat, but production and yields are increasing.

Table 3. Development of lettuce production in the Türkiye

| Years | Hectare | A Index* | B Index** | Tons | A Index* | B Index** | kg/ha | A Index* | B Index** |
|-----------|---------|----------|-----------|---------|----------|-----------|--------|----------|-----------|
| 2000-2004 | 2,073 | 100.00 | | 349,000 | 100.00 | | 16,834 | 100.00 | |
| 2005-2009 | 2,241 | 108.11 | 108.11 | 434,196 | 124.41 | 124.41 | 19,382 | 115.14 | 115.14 |
| 2010-2014 | 2,121 | 102.32 | 94.64 | 430,177 | 123.26 | 99.07 | 20,281 | 120.48 | 104.64 |
| 2015-2019 | 2,188 | 105.58 | 103.19 | 480,733 | 137.75 | 111.75 | 21,974 | 130.54 | 108.35 |
| 2020 | 2,182 | 105.28 | 99.71 | 520,151 | 149.04 | 108.20 | 23,837 | 141.60 | 108.48 |
| 2021 | 2,114 | 101.97 | 96.86 | 540,569 | 154.89 | 103.93 | 25,577 | 151.94 | 107.30 |
| 2022 | 2,166 | 104.52 | 102.50 | 561,990 | 161.03 | 103.96 | 25,941 | 154.10 | 101.42 |
| 2023 | 2,165 | 104.48 | 99.95 | 577,773 | 165.55 | 102.81 | 26,682 | 158.50 | 102.86 |

*(Average of 2000-2004=100), **(Previous year=100)

Source: [3].

The share of greenhouse lettuce production in Türkiye ranged from 10.41% to 27.63% between 2000 and 2023. The share of open field production was between 72.37% and 89.59%. Lettuce production shifted from open-field production to greenhouse production (Fig. 1).

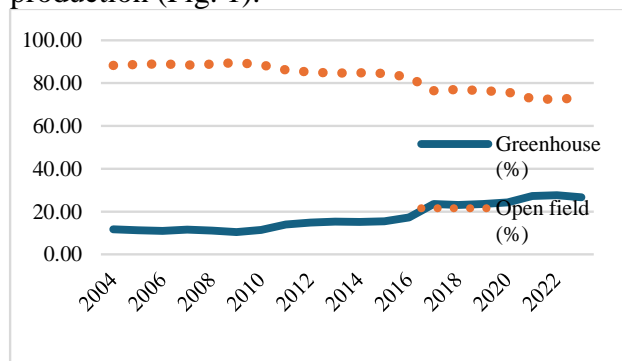


Fig. 1. Shares of lettuce produced in greenhouses and open field in Türkiye

Source: Own calculation from TURKSTAT data [9].

Price analysis of lettuce

When monthly lettuce prices in Türkiye between 2010 and 2023 were analyzed, the highest average prices were in September (490.36 TRY/ton), August (483.17 TRY/ton), and February (407.30 TRY/ton). The lowest average prices were recorded in May (260.36

TRY/ton), June (271.87 TRY/ton), and July (311.07 TRY/ton). In August, September, and December, the standard deviation values were high, and fluctuations in lettuce prices were higher in these months than in the other months. In May-June-July, the standard deviation values were low, and lettuce prices were more stable in these months than in other months. The months with high coefficients of variation were August and September. The lettuce prices in these months were more variable than average lettuce prices. In May, when the coefficient of variation was low, lettuce prices were less variable than average lettuce prices. The months with the highest seasonal index values were February, September, August, and February. Lettuce prices in these months were above the year average. The months with the lowest values were May, June, and July. In these months, lettuce prices were below the year average (Table 4).

Although seasonal fluctuations were observed in lettuce prices in Türkiye throughout the year, prices decreased in May-June-July and increased in August and September.

Table 4. Seasonal fluctuations in lettuce real prices

| Months | Arithmetic Mean (TRY, ton) | Standard deviation | Coefficient of variation | Seasonal index |
|-----------|----------------------------|--------------------|--------------------------|----------------|
| January | 341.48 | 121.18 | 35.49 | 96 |
| February | 407.30 | 193.19 | 47.43 | 115 |
| March | 337.04 | 149.07 | 44.23 | 95 |
| April | 321.40 | 125.83 | 39.15 | 91 |
| May | 260.36 | 56.44 | 21.68 | 74 |
| June | 271.87 | 77.50 | 28.51 | 77 |
| July | 311.07 | 90.40 | 29.06 | 88 |
| August | 483.17 | 574.36 | 118.87 | 137 |
| September | 490.36 | 454.57 | 92.70 | 139 |
| October | 348.11 | 137.66 | 39.55 | 98 |
| November | 318.04 | 159.39 | 50.12 | 90 |
| December | 356.97 | 258.37 | 72.38 | 101 |

Source: Own calculation.

Real lettuce prices in Türkiye varied between TRY 152.46/ton and TRY 832.44/ton between 2010 and 2014. The average price per ton during this period was 352.59 TRY. In the period 2015-2019, lettuce prices per ton varied between 177.21 TRY and 642.88 TRY. In the period 2020-2023, lettuce prices varied between 155.63 TRY and 2 468.43 TRY. In all years analyzed, lettuce prices per ton varied between 152.46 TRY and 2 468.43 TRY. Lettuce price volatility was 30.89%, 24.62%, and 54.72% for these periods and 37.57% for the average of 2010-2023 (Table 5).

Lettuce prices were volatile throughout the period. The period with the highest level of price volatility was 2020-2023.

Table 5. Volatility in annual lettuce prices

| Years | Average (TRY, ton) | Minimum (TRY, ton) | Maximum (TRY, ton) | Volatile (%) |
|-----------|--------------------|--------------------|--------------------|--------------|
| 2010-2014 | 352.59 | 152.46 | 832.44 | 30.89 |
| 2015-2019 | 312.98 | 177.21 | 642.88 | 24.62 |
| 2020-2023 | 406.79 | 155.63 | 2468.43 | 54.72 |
| 2010-2023 | 353.93 | 152.46 | 2468.43 | 37.57 |

Source: Own calculation.

Based on the average lettuce real prices in Türkiye in 2010, the change in lettuce prices in other years was analyzed. Although lettuce prices were 464.8 TRY per ton in 2010, they increased by 67.38% to 778 TRY in 2023. Compared with the base year, lettuce real prices decreased in all other years except 2023. The highest decrease in real lettuce prices by base year was realized in 2022. In

2019, average lettuce prices decreased by 47.07% to 246 TRY/ton (Table 6).

In a study examining the developments in lettuce prices in Türkiye using data from 1997 to 2006, it was determined that prices trended downward. In the 10-year period they analyzed, the highest and lowest lettuce prices were in January and November, respectively [4].

Table 6. Changes in the annual real lettuce prices

| Years | Average (TRY, ton) | Index (2010=100) |
|-------|--------------------|------------------|
| 2010 | 464.8 | 100.00 |
| 2011 | 322.3 | 69.34 |
| 2012 | 366.9 | 78.94 |
| 2013 | 340.3 | 73.21 |
| 2014 | 268.7 | 57.81 |
| 2015 | 363.1 | 78.12 |
| 2016 | 289.3 | 62.24 |
| 2017 | 287.2 | 61.79 |
| 2018 | 273.2 | 58.78 |
| 2019 | 352.1 | 75.75 |
| 2020 | 306.4 | 65.92 |
| 2021 | 296.8 | 63.86 |
| 2022 | 246.0 | 52.93 |
| 2023 | 778.0 | 167.38 |

Source: Own calculation.

Seasonal index values of lettuce prices in Türkiye were calculated and compared in three ways: simple average, moving average, and trend analysis. According to all three methods, lettuce prices increased in August and September and decreased in May and June. It was determined that prices increased starting from August and remained high until April (Table 7). The period from August to April was found to be the most profitable production period for farmers. Therefore, lettuce producers should make production plans considering these periods.

In a study analyzing seasonal fluctuations in lettuce prices in Türkiye using data from 1997 to 2006, it was determined that lettuce prices were high from December to April, while prices were low in June to July and October to November [4].

In a study analyzing seasonal fluctuations in lettuce prices in Brazil using data from 2012 to 2017, it was found that the highest price index occurred in February to March and December, whereas the lowest price index occurred in August and October [3].

Table 7. Seasonal fluctuations in lettuce real prices using simple average, moving average, and trend ratio methods

| Months | Seasonal index with simple average | Seasonal index with a moving average | Seasonal index with rate on trend |
|-----------|------------------------------------|--------------------------------------|-----------------------------------|
| January | 96 | 96 | 99 |
| February | 115 | 104 | 118 |
| March | 95 | 102 | 97 |
| April | 91 | 88 | 91 |
| May | 74 | 82 | 74 |
| June | 77 | 81 | 77 |
| July | 88 | 102 | 88 |
| August | 137 | 123 | 133 |
| September | 139 | 126 | 136 |
| October | 98 | 111 | 99 |
| November | 90 | 98 | 90 |
| December | 101 | 88 | 100 |

Source: Own calculation.

From January 2010 to December 2023, monthly real lettuce prices reached their lowest level in April 2011 (152.46 TRY/ton) and their highest level in August 2023 (2 468.43 TRY/ton). Lettuce prices fluctuated considerably during the period analyzed. In August, September, and December 2023, lettuce prices reached their highest levels (Fig. 2).

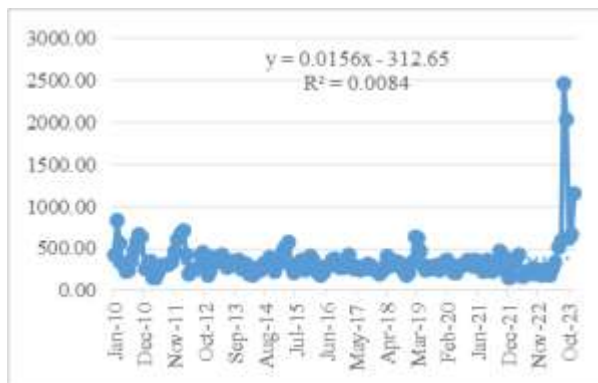


Fig 2. Lettuce real prices
 Source: Own calculation.

From January 2010 to December 2023, monthly lettuce price volatility was 30.89% for the period 2010-2014, 24.62% for the period 2015-2019, 54.72% for the period 2020-2023 and 37.57% for the average of 2010-2023. It was determined that there were monthly fluctuations and time volatility in lettuce prices during the period analyzed. Price volatility peaked in August 2023 at 316.38% (Fig. 3).

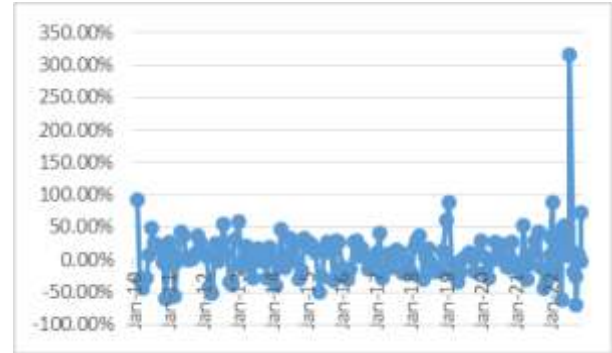


Fig 3. Volatility of lettuce prices
 Source: Own calculation.

CONCLUSIONS

Lettuce production increased worldwide between the periods examined (2000-2023), depending on the lettuce production area. There was no change in lettuce yield. In Türkiye, production increased to a greater extent than the production area. The reason for this was the 58.5% increase in lettuce yield due to improvements in agricultural practices during the study period. For the period under review (2010-2023), real lettuce prices increased in August and September and decreased in May, June, and July. The seasonal index was lowest in May and highest in September. It was also calculated that lettuce prices were highly volatile during all analyzed periods. Especially in the 2020-2023 periods, price volatility intensified. The most profitable production periods for lettuce were August and September. If producers adjust their production planning according to these months, they can earn higher profits.

REFERENCES

- [1] Bayav, A., 2022, Economic place of vegetable growing in the world and Türkiye's competitiveness analysis, Different Approaches in Vegetables (in Turkish). Iksad Publications, 3-20p.
- [2] FAOSTAT, 2024, Food and Agriculture Organization of the United Nations. <https://www.fao.org/faostat/en/#data/QCL>, Accessed: 25 June 2024.
- [3] Ferreira, T. C. R., Silva, L. F. L., Maluf, W. R., Resende, L. V., 2024, Seasonal variation of lettuce supply and prices in Minas Gerais. Revista Ceres, 71, e71015.
- [4] Gül, M., Dağistan, E., Demirtaş, B., Yılmaz, H., Karataş, A., Yılmaz, Y., 2009, Antalya ilinde bazı sebze fiyatlarındaki gelişmeler ve mevsimsel

dalgalanmalar. MKU Ziraat Fakültesi Dergisi, 14(2), 57-68.

[5]Güneş, T., R., Arıkan, 1988, Agricultural economics statistics, (in Turkish). Ankara University Agricultural Faculty Publications, 293p.

[6]Kadakoğlu, B., Gül, M., 2023a, Recent developments in vegetable production in the world and Türkiye. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 23(3), 409-418.

[7]Kadakoğlu, B., Gül, M., 2023b, Foreign trade structure of vegetable sector: Development process in the world and Türkiye. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, 23(3), 419-429.

[8]Şirikçi, B. S., Gül, M., 2019, The change of the production and producers' price of dry-onion in the world and Turkey. 2. International Conference on "Agriculture, Forestry & Life Sciences", April 18-20, Prague, Czech Republic, 61-74p.

[9]TURKSTAT, 2024a, Turkish Statistical Institute, Crop Production Statistics. <https://biruni.tuik.gov.tr/medas/?kn=92&locale=tr>, Accessed: 25 June 2024.

[10]TURKSTAT, 2024b, Turkish Statistical Institute, Producer Price Index for Agricultural Products. <https://data.tuik.gov.tr/Kategori/GetKategori?p=Enflasyon-ve-Fiyat-106>, Accessed: 01 June 2024.