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DEVELOPMENT OF DRY ONION PRODUCTION, FOREIGN TRADE, AND SEASONAL PRICES IN TURKEY

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Abstract

This study examined the change in the dry onion market in the world and Turkey. The study used data from FAO and TURKSTAT institutions from 1980-to 2021. Considering the developments in the production and foreign trade of dry onions in the world and Turkey, the world production of dry onions, which was 21.71 million tons compared to the average of 1980 at the beginning of the period, increased by 382% rose to 104.55 million tons in 2020. India occupies the first place in the world production of dry onions 8% of the onions produced in the world are exported. During the studied period, the amount of world dry onion exports increased by six times, and its value increased by 12.8 times. The Netherlands has the highest share of dry onion export values (22.10%). According to the period of 1980, the production of dry onions in Turkey has increased by 2.5 times. Compared to 1980, the production area increased by 3%. Therefore, productivity improvements have a primary impact on production growth.

Key words**:** *dry onions, production, foreign trade*

INTRODUCTION

Onion (*Allium cepa* L.) although it is one of the most important vegetables worldwide, it is a plant known for its unique taste and aroma due to the sulphur compounds it contains. In recent years, dry onions with high-quality characteristics have been the reason for preference in the food industry [13, 14].
Onions (*Allium cepa* L.) are very consumed in Turkey and are an important source of nutrients. It is also one of our vegetables with extremely high economic importance. In addition to its use as a food, it is used to treat chickenpox, common colds, and diseases such as flu, measles, and rheumatism [12].
[6] focused on the fluctuations in onion prices in the 1975-1994 period and its measurement and calculated the marketing margins according to both current and real prices in Turkey.
In a study conducted in the Polatlı district of Ankara province, the level of physical input usage, production costs, gross and net profit levels of dry onions were calculated [3]. Another study revealed the physical utilisation levels of average production inputs of onion per decare in aqueous conditions in the Konya region and dry conditions in the Bursa and Tokat regions [2]. [15]analysed the onion prices and seasonal fluctuations received by the producers in the 1970-1989 period.
[16] discussed the changes in onion production and prices in the world and Turkey. They reported that dry onion production increased 4.37 times in the 1980-2017 period due to the cultivation area and yield expansion. Turkey ranks 7th in the world's dry onion production. They determined that the dry onion trade has made significant development globally, and the amount and value of exports increased by 3.94 and 6.73 times, respectively. They reported that Turkey's share in world production and exports decreased. They found that dry onion producer prices fluctuated significantly, and the marketing margin increased in Turkey. They reported that mainly the increasing exchange rate increased producer prices. [10] analysed the causal relationship between harvested area and the profit in onions and potatoes. [8] investigated the compatibility of

onion production and price with the spider web theory using annual data between 1980 and 2017 for Turkey.
[7] evaluated onion producers' production and marketing processes (Amasya province center district example) with 2018 data.
In this study, the changes in the production and foreign trade of onions in the world and Turkey and the developments in the prices of onions in Turkey were examined.

MATERIALS AND METHODS

The main material of the study was the statistical data of FAO and TURKSTAT. In this context, the areas, yields, production and export data of dry onions between 1980 and 2020 in the countries important for the production of dry onions were evaluated. The data was analysed using indices and ratios. While the annual onion prices received by the producers and consumer prices were analysed, the 1980-2021 TURKSTAT data set was used [17]. For the monthly prices received by the producer, TURKSTAT data was obtained for the period 1994:01-2021:12, and the monthly consumer prices series for the period 2003:01-2021:12.
The prices received by the farmers were converted into real prices (2003 prices) by taking into account the 2003=100 based monthly Producer Price Index (PPI) and the monthly consumer prices by considering the Consumer Price Index (CPI). Year-to-year fluctuations in prices and seasonal fluctuations were calculated. Coefficients of variation and price volatility were calculated. Theoretically, volatility refers to an uncertain movement of a random variable over a period of time. The volatility in agricultural product prices is of great importance as the associated uncertainty is one of the main factors affecting the income security of producers and traders, which threatens the performance of agriculture and the welfare of consumers [19, 11]. Therefore, in general, variable agricultural product prices are a policy priority that attracts the attention of economists and policymakers.
For the 2003-2021 data set, the difference between the price received by the farmer and the price paid by the consumer was calculated as the "Marketing Margin".

RESULTS AND DISCUSSIONS

The amount of dry onion production in the world amounted to 104,554 thousand tons in 2020. The two most important countries in the production of dry onions are India, with a production of 26,738 thousand tons and a share of 25.57%, and China with a production of 23,660 thousand tons and a percentage of 22.63%. These two important producing countries are followed by the USA with 3,821 thousand tons, Egypt with 3,156 thousand tons and Turkey with 2,280 thousand tons respectively. The world production of dry onions has increased by 5.06% compared to the previous year and by about 7.33 times compared to 1961 [4].
According to the 1980 production data, the amount of world onion production increased by 382% in 2020.
India ranks first with 25.57% of the production volumes in 2020, while China's share of world onion production is 22.63%. The USA follows it with a rate of 3.65%, Egypt with a rate of 3.02%, and Turkey with a rate of 2.18%. Over the past 30 years, the contribution of China and India to the world production of dry onions has increased. India's share in world onion production in 1980, which was the beginning of the semester, was 10.49%, while the end-of-semester production rate was 25.57%. On the other hand, China's share in world onion production increased from 15.31% at the beginning of the period to 22.63% at the end of the period. Turkey's onion production accounts for 2.18% of world production (Table 1).
The amount of dry onion production in the world amounted to 104,554 thousand tons in 2020. According to the 1980 production data, the world production of dry onions increased by 382% in 2020. It is also seen that the expansion of the harvested area by 250.72% and the increase in the yield obtained from the unit area by 37.46% are effective in increasing the amount of production (Table 2).

Table 1. World onion production quantities of countries (thousand tons)

	India	China	USA	Egypt	Turkey	Other Countries	World
1980	2,277	3,324	1,625	653	889	12,938	21,706
1985	2,747	4,048	1,854	709	1,097	14,841	25,296
1990	2,974	4,780	2,142	657	1,371	17,315	29,239
1995	3,841	6,555	2,687	554	1,920	19,042	34,599
2000	4,467	11,234	3,134	644	2,194	23,436	45,109
2005	6,584	17,200	3,333	853	2,012	26,915	56,897
2010	13,118	20,698	3,407	1,778	1,876	32,145	73,022
2015	18,390	22,483	3,269	2,195	1,890	38,156	86,383
2016	20,931	23,727	3,801	2,459	2,121	41,910	94,949
2017	22,427	23,699	3,737	2,965	2,176	41,776	96,780
2018	23,262	23,604	3,284	3,067	1,931	41,731	96,879
2019	22,819	23,677	3,551	3,077	2,200	44,197	99,521
2020	26,738	23,660	3,821	3,156	2,280	44,899	104,554
2020 index (1980=100)	1174.26	711.79	235.14	483.31	256.47	347.03	481.68
2020	25.57	22.63	3.65	3.02	2.18	42.94	100

Source: [4].

Table 2. The world onion production, area, and yield

Years	Production Quantity (thousand/ton)	Cultivated Area (ha)	Yield(tonnes per ha)
1980	21,705.79	1,562.12	13.88
1985	25,296.42	1,697.13	14.89
1990	29,238.96	1,840.98	15.88
1995	34,598.86	2,114.84	16.37
2000	45,108.78	2,679.90	16.81
2005	56,896.64	3,207.63	17.72
2010	73,022.03	3,976.30	18.35
2015	86,382.80	4,624.11	18.69
2016	94,948.86	5,076.33	18.70
2017	96,780.28	5,144.04	18.81
2018	96,878.76	5,146.73	18.82
2019	99,521.44	5,152.42	19.31
2020	104,554.46	5,478.65	19.08

Source: [4].

Figure 1 shows the change in onion production quantities in the World, India, China, and Turkey. It is observed that the world onion production volumes have been increasing since 1970. The world onion production increased by 6.24 times from 16.75 million tonnes in 1970 to 104.55 million tonnes in 2020. India's onion production increased by 14.85 times from 1.8 million tonnes in 1970 to 26.74 million tonnes in 2020. China's onion production also increased 8.75 times in 2020 compared to 1961. China’s dry onion production was 2.71 million tonnes in 1970, and 23.66 million tonnes in 2020. Turkey's onion production increased from 0.68 million tonnes in 1970 to 2.28 million tonnes in 2020. This 3.35-fold increase in Turkey's onion production indicates that the efficiency of onion production in our country is high.

When the shares of selected major countries in onion harvested areas were examined based on 1980, onion harvested regions of India and Nigeria have increased worldwide. The percentage of onion harvested areas in Russia has started and continued to decrease between the periods 1990-1995. Turkey's share in onion harvested areas increased to the highest rate in 1995 with 4.7% and began to decline in later periods. When the percentage distributions of the world onion harvested areas based in 1970 were examined, it increased from 12.4% to 26.2% in India, from

10.5% to 19.8% in China, and from 1.9% to 12% in Nigeria.

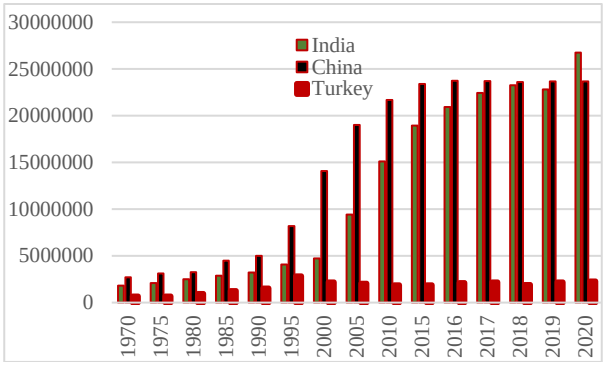

Fig. 1. China, India, and Turkey dry onion production quantities
Source: [4].

It decreased from 9.8% to 1.1% in Russia and from 5.2% to 1.3% in Turkey. Although the cultivation area in 1970 and the cultivation areas in 2020 in Turkey are close to each other, the reason for the difference between the rates is the high increase in the onion cultivation areas in the world.

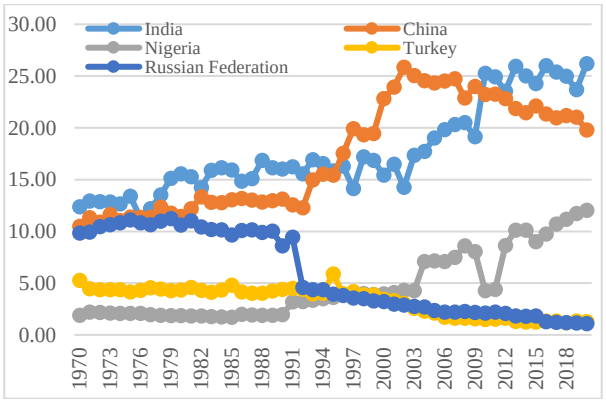

Fig. 2. Change of harvested areas by year in selected countries
Source: Our Calculation from FAOSTAT data.

The yield of dry onions per hectare between 1970-2020 in the world, China, India, and Turkey were given in Figure 3. The average yield in the world, China, India, and Turkey have increased overall. The yield of dry onions in Turkey has risen above the world yield since 1985. In 2020, the yield of dry onions per hectare in the world was 19.1 tonnes per ha. The yield per hectare in China was 21.8 tonnes per ha. The yield per hectare in India was 18.6 tonnes. In Turkey, the yield of dry onions per hectare was 32.4 tonnes. According to 1980, the average yield of dry onions in the world has increased by 37%. The average yield of dry onions in India has increased by 72%, while it has increased by 19% in China. In Turkey, the average yield of dry onions has increased by 150% compared to 1980. According to 1970, the average onion yield in Turkey has increased by 3.34 times [4].

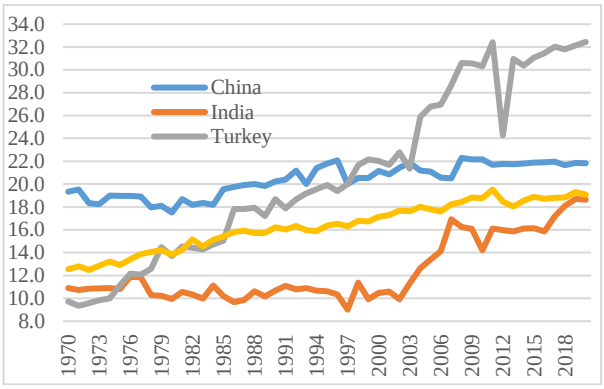

Fig. 3. India, China, World, and Turkey dry onion yield (tonnes per ha)
Source: [4].

In Turkey, the dry onion harvested area, which was 788,000 ha in 2004, decreased by 13.08% to 684,910 ha. The production of dry onions, which was 2,040,000 tons in 2004, also increased by 11.76% to 2,280,000 tons. Harvested area of dry onions was increasing and decreasing slightly over the years, and by 2020, it was observed that onion harvested areas were reduced compared to 2004. There are also increases and decreases in the production of dry onions. However, despite the reduction in harvested areas, the production amount in 2020 increased compared to dry onions in 2004 (Table 3).
The Netherlands, India, and China occupy the first three places in the world in terms of exports of dry onions. The Netherlands occupies first place with 1,751.4 thousand tons, while India occupies second place with 1,448.7 thousand tons.
China follows them with 881.3 thousand tons, Mexico with 424.4 thousand tons, Egypt with 369.2 thousand tons, and the United States with 365.4 thousand tons, respectively. Turkey's world onion export volume was 220.7 thousand tons with 10.

Table 3. Development of harvested and production of dry onions in Turkey

Years	Cultivated area (decare)	Cultivated area index (2004=100)	Production (ton)	Production index (2004=100)
2004	788,000	100.00	2,040,000	100.00
2005	772,800	98.07	2,070,000	101.47
2006	654,664	83.08	1,765,396	86.54
2007	649,228	82.39	1,859,442	91.15
2008	656,292	83.29	2,007,118	98.39
2009	605,579	76.85	1,849,582	90.67
2010	626,979	79.57	1,900,000	93.14
2011	661,185	83.91	2,141,373	104.97
2012	722,319	91.66	1,735,857	85.09
2013	616,324	78.21	1,904,846	93.37
2014	600,441	76.20	1,790,000	87.75
2015	577,040	73.23	1,879,189	92.12
2016	604,026	76.65	2,120,581	103.95
2017	576,918	73.21	2,175,911	106.66
2018	527,133	66.90	1,930,695	94.64
2019	613,588	77.87	2,200,000	107.84
2020	684,910	86.92	2,280,000	111.76
2021	698,972	88.70	2,500,000	122.55

Source: [17].

Based on 1980, the amount of Dutch dry onion exports increased by 4.60 times in 2020. It is observed that India's export volume has increased by 13.5 times, and the amount of onion exports in China for 2020 has increased by 45.9 times compared to 1980. According to the data from 1980, the amount of onion exports increased by 6.8 times in Turkey (Table 4).

Table 4. World onion export volume (1,000 tons)

	Netherlands	India	China	Mexico	Egypt	USA	Spain	Pakistan	Peru	Turkey	Other Countries	World
1980	380.9	108.5	19.2	46.8	54.1	107.4	189.4	28.5	0.2	32.4	429.2	1,396.6
1985	438.8	207.5	20.7	72.1	21.5	104.8	267	51	0	130	496.8	1,810.3
1990	441.3	227.9	3.7	144	42.8	115	263.5	57.6	0.1	138.9	640.3	2,075.0
1995	538.4	350.8	29.3	200.3	100.5	242.8	231.1	10.8	1.5	138.2	1,037.8	2,881.3
2000	506.8	316.3	122.9	254.9	122.3	299.9	226.3	49.7	27.2	134.5	1,375.3	3,436.2
2005	745	737.2	398.4	266.4	286.3	320	211.9	58.1	47.3	115.1	1,451.3	4,636.9
2010	1,085	1,420.6	586	301	230.4	311.1	242.1	46.8	95.4	150	1,747.7	6,216.2
2015	1,244	1,285.9	741.6	379.4	429.6	337.9	300.4	124.3	177.6	147.4	1,678.1	6,845.9
2016	1,231.1	1,837.2	711.1	412.9	457.3	325.6	356.4	76	209	105.9	1,812.5	7,534.9
2017	1,551.5	1,621.7	920.9	421	452.4	327.9	338.3	60	191.3	248.2	1,533.3	7,666.6
2018	1,511.4	1,688.4	910.1	432.6	237	359.7	356.3	210.6	219.2	101.3	1,564	7,590.5
2019	1,596.1	1,460.5	983.7	352	487	402.4	412.3	166.3	248.7	235.2	2,141.3	8,485.7
2020	1,751.4	1,448.7	881.3	424.4	369.2	365.4	357.5	304	255.7	220.7	2,073.8	8,452.2
2020 index (1980-=100)	459.81	1,335.21	4,590.10	906.84	682.44	340.22	188.75	1,066.67	127,850.00	681.17	483.18	605.20
%	20.72	17.14	10.43	5.02	4.37	4.32	4.23	3.60	3.03	2.61	24.54	100.00

Source: [4].

The world onion export volume was 8,452.2 thousand tons in 2020 and the export value was $ 3.16 billion. 53.31% of onion exports were carried out by the Netherlands, India, China, and Mexico. The fact that countries such as India and China, which also took the first place in production, lost the first place in trade to the Netherlands was due to the fact that their domestic consumption was high (Table 5).

The first place in the world onion export value for 2020 was occupied by the Netherlands with $ 797.4 million. The Netherlands was followed by China with $ 495.4 million, while these two countries followed Mexico with $ 419.8 million. India ranks first in production

with 26,738 thousand tons and ranks fourth in the world onion export value with $ 346.6 million. The United States ranked fifth in the world onion export value with $249.9 million. Turkey was the 11th with a world onion export value of $ 51.4 million (Table 5).

Table 5. World onion export value (US$ million)

	Netherlands	China	Mexico	India	USA	Egypt	Spain	Pakistan	Peru	Poland	Turkey	Other Countries	World
1980	82	3	4.4	18.3	26	13.7	25.8	4.9	0	5.8	5.7	91.8	281.3
1985	77.9	4.1	8.4	38	33.7	7.4	43.7	6.2	0	6.5	18.5	109.6	354.2
1990	99.4	0.6	50.8	43	35.6	10.7	55.6	4.7	0	13.2	13.8	141.6	468.9
1995	158.4	8.5	128.3	60.5	91.3	16.3	70.1	1.3	0.3	23.4	21.2	268.1	847.5
2000	128.3	27.5	155.9	56	101.9	12.9	57.8	10.6	7.9	15.8	20.2	309.6	904.4
2005	181	79.2	201.8	120	124.6	27.7	60.2	6.3	13.4	26.5	12.6	328.5	1,181.7
2010	407.6	167.9	259.4	375.3	188.6	88.1	107.1	8.5	25.9	56.9	21.5	533.6	2,240.4
2015	470.3	367.2	343.8	403.9	229.8	202.2	137	26.9	57.8	53	24.9	580.2	2,896.9
2016	479.4	456.5	415.9	382.4	230	197.8	154.3	13.1	70	51.3	12.5	536.9	3,000.1
2017	515.5	506.8	386.7	423.2	219.5	206.5	133.4	11.9	69	51.9	40.6	462.9	3,027.9
2018	656.1	509.5	428.3	419.6	231.7	118	177	48.6	74.1	82.6	16.6	535.7	3,297.9
2019	763.6	604.4	360.9	367.3	287.7	243.9	213	67.3	87.6	102.8	54	722.9	3,875.4
2020	797.4	495.4	419.8	346.6	249.9	175.1	155.9	124	94.9	87.8	51.4	609.5	3,607.7
2020 index (1980-=100)	972.44	16,513.33	9,540.91	1,893.99	961.15	1,278.10	604.26	2,530.61	31,633.33	1,513.79	901.75	663.94	1,282.51
% Share	22.10	13.73	11.64	9.61	6.93	4.85	4.32	3.44	2.63	2.43	1.42	16.89	100.00

Source: [4].

1980-2020 annual price movements in Turkey

When current prices were analysed from 1980 through 2021, in 2020, the prices of dry onions, which were received by Turkish farmers, increased by more than 3.7 million times compared to 1980. On the other hand, the Producer Price Index rose more than 17 million times in the same period. This indicates that the increase in dry onion prices was below the rise in the index, and therefore there is a situation against the dry onion producers. The coefficient of variation covering forty-two years was found to be 115.75 for Turkey at current prices. The concepts of volatility and uncertainty express two basic meanings of volatility. Here, variability refers to all movements, uncertainty refers to unknown movements [18]. The volatility in the current prices of dry onions was calculated as 69.78% in the period under consideration. Price volatility is defined as an important economic problem.

When the real prices (2003 prices) were analysed, while the dry onion prices received by the farmers on average in Turkey in 1980 were 587.07 TRY per ton, they decreased by 78.69% in 2021 and became 125.08 TRY. In Turkey, the highest price was 875.38 TRY in 1994, and the lowest was 125.08 TRY in 2021 (Figure 1). In this period, the coefficient of variation in real prices was calculated as 38.49 for Turkey. As a matter of fact, this variation can be observed in Figure 4. Therefore, the annual variation is high in the provinces examined.

From 1980-to 1989, dry onion prices received by the producers were 371.43 TRY on average. Prices followed a fluctuating course between 248.20 TRY and 587.07 TRY. It reached its peak in 1980 and its lowest value in 1986. 1984, 1985 and 1981 were the years when it showed peak points. Dry onion price volatility was 36.86% in this period. In this period, prices showed bottom and top values every two years. From 1990-to 1999, onion prices per ton, which were received by producers, increased to 511.61 TRY on average. Prices rose to 875.38 TRY from 288.39 TRY. It reached its peak value in 1994. In addition, there were four peak values in 1990, 1998, and 1997. Prices were very volatile and in an upward trend. As a matter of fact, the price volatility received by the producer rose to 52.65%. From 2000-to 2010, the prices of dry onions received by the producer per ton decreased to 348.68 TRY on average. Prices declined from 273.14 TRY to 514.61 TRY band and showed a much less volatile trend. As a matter of fact, the price volatility received by the producers in this period decreased significantly to 21.03%. It reached its peak value in 2010, 2004, and 2000. In the years 2011-2021, the price

received by the manufacturer was between 125.08 TRY and 395.59 TRY. It decreased to 251.29 TRY on average during this period. The bottom and top values of the prices were at intervals of one or two years. As a matter of fact, the price volatility received by the producer increased to 27.03%. It reached its peak in 2011, the second peak in 2019, the third peak in 2016, and the fourth peak in 2015.

The volatility of real onion prices received by farmers in the analysed period was 35.41%. High price volatility also caused significant risk and uncertainty in farmer incomes.

Fatima et al. [5] found that the average annual wholesale prices of onions and potatoes in Pakistan's major markets (Lahore, Hyderabad, Peshawar, and Quetta) increased over time. They found that the wholesale prices of onions in the markets increased by 8.97%, 8.82%, 8.53%, and 8.88%, respectively. They suggested that the rising prices of these two basic foodstuffs would be difficult for consumers to manage.

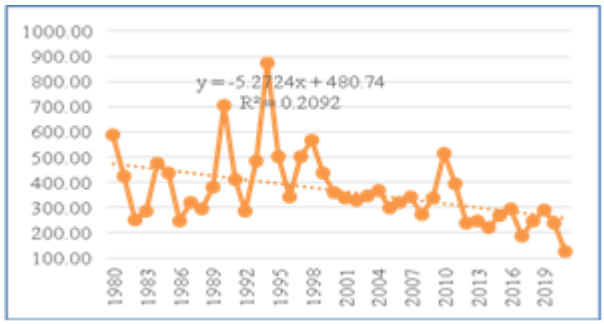

Fig. 4. Development of annual real onion prices received by farmers in Turkey (TRY per ton)
Source: Our Calculation from TURKSTAT data.

Therefore, the government should take some measures, rules, and regulations regarding price control.

Seasonal fluctuations-Producer level

Seasonal analysis of the prices received by the dry onion farmers and the prices paid by the consumer was made in order to help the dry onion producers make the right decisions for production planning, marketing, and storage.

Real prices were calculated and interpreted in order to eliminate the effect of the increases in the general price level on the onion price. For this purpose, the current prices received by the onion farmers were found by using the PPI (with Producer Price Index-2003=100) in the 1994-2021 period, and the general trend of the obtained real price series, seasonal index, and coefficients of variation were calculated using the simple average method.

The real prices of onion farmers received their lowest value in December 2021 and November 2021 and reached their highest value in May 1994 and April 1994. In general, the prices were at their highest during the first season of onions. In 2014, however, the high export volume pushed the prices up. In the 1994-1999 period, prices fluctuated between 170.36 TRY and 1,191.07 TRY per ton, with an average of 546.32 TRY. Price volatility was 16.34% (Figure 5).

In the 2000-2009 period, prices were at the lowest level of 224.32 TRY, and the highest 540.23 TRY band, showing a downward trend and realised as 332.85 TRY on average. Price volatility also fell to 8.53% (Figure 5).

Prices were low at 80.22 TRY and high at 983.09 TRY in the 2010-2021 period. They continued their downward slope and averaged 273.52 TRY, but price volatility increased to 11.83% (Figure 5). In fact, prices tend to decrease with the introduction of first-season onions. Significant annual and seasonal fluctuations were observed in the analysed period, but the prices of onion producers generally showed a decreasing trend, and price volatility continued ($Y_{1994\text{-}2021}$ = -0.036x + 1,771.7; R^2 = 0.3872) (Figure 5).

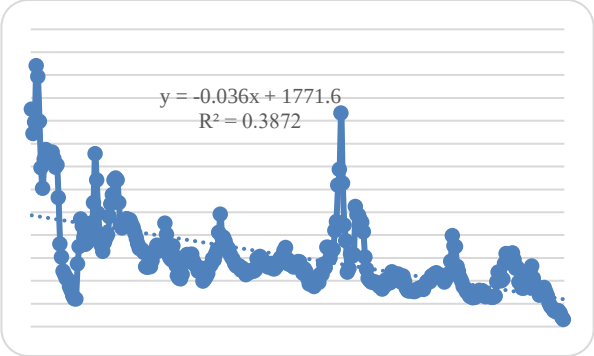

Fig. 5. Development of monthly producer prices of dry onions in the period 1994-2021 at real prices (TRY per ton)
Source: Our Calculation from TURKSTAT data.

When the seasonal index and coefficients of variation are analysed for 1994-2021 with the simple average method [1], the price per ton

reaches its highest value in April with 398.24 TRY. The coefficient of variation in this month is 61.01. The season index was 113 for this month. It was above the average value in May, March, February, January, and June (Table 6). The seasonal index had the lowest values in October, September, and November. In the Central Anatolian provinces, where dry onion production is intense in Turkey, the dry onion harvesting periods are also in these months.

The January-June period, when the real prices of onions were the most favourable, also had the highest value of the coefficient of variation (Table 6).

Table 6. Seasonal index of dry onion monthly producer prices

	Average real price (TRY per ton)	Standard error	Coefficient of variation (%)	Seasonal index (%)
January	372.70	183.25	49.17	106
February	378.11	182.20	48.19	107
March	380.30	193.64	50.92	108
April	398.24	242.97	61.01	113
May	392.04	229.75	58.60	111
June	371.07	180.19	48.56	105
July	348.46	135.22	38.81	99
August	326.64	118.62	36.31	92
September	312.31	125.78	40.28	88
October	311.22	130.89	42.06	88
November	317.60	134.68	42.40	90
December	329.31	135.88	41.26	93

Source: Our Calculation from TURKSTAT data.

Seasonal fluctuations-Consumer level

Seasonal analysis of the prices paid by the dry onion consumer was also made. Accordingly, real prices were calculated in order to eliminate the effect of inflation increases on **onion** prices, current prices were used in the CPI (with the Consumer Price Index-2003=100) in the 2003-2021 period, and the general trend of the obtained real price series, seasonal index, coefficients of variation were calculated with the simple average method.

The real prices paid by the consumer for dry onions reached their lowest value (303 TRY per ton) in April 2005 and reached their highest value (1,552 TRY per ton) in April 2010. The real prices paid by the consumer for dry onions had an increasing trend (Y2003-2021 = 0.0027x + 429.04; R^2 = 0.0006). In the 2003-2021 periods, the second-highest consumer price paid for dry onions was April 2019 (1,462 TRY per ton), and the third-highest price was in March 2004 (1,262 TRY per ton). Price volatility was also 17.25% (Figure 6). In the 2003-2009 period, prices were at the lowest 302.69 TRY, and the highest 1261.88 TRY band, showing an increasing trend and amounting to 509.26 TRY on average. Price volatility was also 12.39% (Figure 6).

Prices were at a low of 386.67 TRY, and a high of 1,552.10 TRY in the 2010-2014 period. They continued their upward slope and averaged 552.18 TRY, but price volatility increased 15.45% (Figure 6).

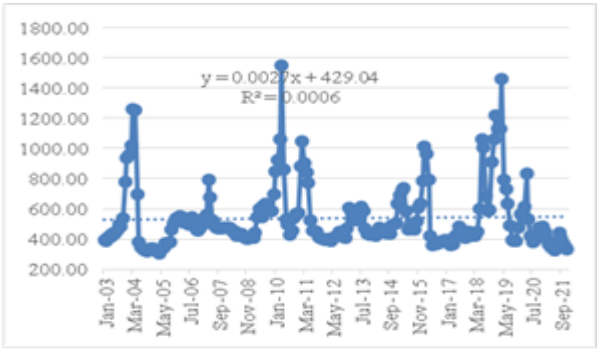

Fig. 6. Development of consumer monthly onion prices in real prices in the period 2005-2021 (TRY per ton)
Source: Our Calculation from TURKSTAT data.

Prices were at a low of 358.36 TRY, and a high of 1,461.86 TRY in the 2015-2019 period, continuing the upward slope and rising to an average of 602.30 TRY, which was reflected in the price volatility and increased

to 19.90% (Figure 6). During the 2020-2021 pandemic period, prices declined to the lowest 321.11 TRY and the highest 837.11 TRY band, showing a downward trend and amounting to 442.57 TRY on average. Price volatility was also 14.77% (Figure 6).

When the seasonal index for the consumer and the coefficients of variation for the 2003-2021 period are examined with the simple average method [1], with a ton price of 686.33 TRY in April, consumers pay the highest price. The coefficient of variation in this month was 54.40. The season index was 128 for this month. In March and February, consumers pay the highest prices (628.61 and 615.14 TRY), but the coefficients of variation are also high. In January and May, consumers pay above the average value (Table 7). The seasonal index has its lowest values in September, October, and August. The increase in dry onion supply in Turkey in this period is the biggest reason for this (Table 7).

As onions pass from the field to the consumer, values are added by the companies that store, transport, sort, package, and even process these products. When ownership changes in the marketing chain, there are different onion prices. Dry onion prices vary from grower to packer, wholesaler, retailer to consumer. The difference between two prices in a marketing chain is called the marketing margin. The margin from the farmer at the head of the marketing chain to the consumer at the other end of the chain is of great interest.

Table 7. Seasonal index of dry onion monthly consumer prices

	Average real price (TRY per ton)	Standard error	Coefficient of variation (%)	Seasonal index (%)
January	592.44	239.42	40.41	110
February	615.14	269.12	43.75	114
March	628.61	291.59	46.39	117
April	686.33	373.37	54.40	128
May	548.80	153.28	27.93	102
June	493.43	166.03	33.65	92
July	495.20	150.43	30.38	92
August	472.78	89.13	18.85	88
September	445.50	65.09	14.61	83
October	456.16	75.61	16.57	85
November	491.90	147.87	30.06	91
December	529.91	190.57	35.96	98

Source: Our Calculation from TURKSTAT data.

The share of the price paid by the consumer for onions in the grower was 66.88% in 2003, and this decreased to 34.7% in 2021.

Characteristics of onion production (small scale), characteristics of the product (volume and high loss rate), characteristics of its supply (seasonal), price instability and fluctuation, the narrow application area of qualitative standards, classification, classification, packaging problems, an abundance of intermediaries, export price, product price, and exchange rate are significantly effective in price formation and increasing the marketing margin. The creation of marketing cooperatives with the participation of producers can have a reducing effect on these margin and price fluctuations.

CONCLUSIONS

Compared to the 1980 average, world onion production, 21.71 million tons, increased by 382% and rose to 104,554 thousand tons in 2020. With this increase in onion production, the contribution of the expansion in the world dry onion cultivation areas was more important (250.72% production area increase). As a matter of fact, world onion yield increased by 37.46% in this period.

India takes first place in the world's dry onion production. India is followed by China, USA, Egypt, and Turkey. In the analysed period, significant increases were experienced in the dry onion production of China, USA, Egypt, and Turkey. In these increases, the expansion of dry onion cultivation areas and yield increases were important. Especially the production of India and China increased considerably compared to 1980.

8.08% of dry onions produced in the world were exported. In the period under review, the amount of dry onion exports increased six times, and its value increased 12.8 times. The country with the highest share in dry onion export values was the Netherlands. The Netherlands was followed by China, Mexico, and India, respectively. Compared to the 1980 period, Turkey's dry onion production increased 2.5 times; the increase in yield had a primary effect on this. 9.67% of dry onions produced in Turkey in 2020 became the subject of export. The share of Turkey in the world dry onion export value was 1.42%.

Input prices and the selling price of onions are important issues in the supply of onions. There have been significant annual and seasonal changes and fluctuations in onion prices in the historical process. The coefficient of variation was high, and the volatility in prices was high. There is a direct relationship between current prices, production, world export price, and Turkey's export price. On the other hand, real prices had an inverse relationship with production and world export prices. The characteristics of dry onion production, the product's features, the characteristics of its supply, the abundance of intermediaries, and the exchange rate are significantly effective in price formation and increasing the marketing margin. At this point, unions or marketing cooperatives to be formed by producers may be important in price fluctuations and in returning the margin to the producer.

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