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RESEARCH ARTICLE

Economic Analysis and Marketing Margins of Chickpea Prices in Turkey

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ABSTRACT

The study examined the producer-consumer prices and marketing structure of the chickpeas in Turkey, with a focus on the production-consumption, foreign trade, price fluctuations and marketing between the years 2003-2017. Despite the reduction in acreage and production rates in Turkey, an increase was observed in the production. In this study, marketing margins of chickpea are calculated according to current and real prices (2017=100). Producer and consumer chain indexes are also calculated according to current prices and compared with annual inflation rates. In fifteen years, the average yield was determined as 113 kg da-1, and the average consumption per person was 6.5 kg year. In fifteen years, the producer earned from 1 kg chickpea production increased by 55% and the amount paid by the consumer increased by 86%. In the fifteen-year period, prices have been in real favor for the producers and against the consumer. The model related to chickpea production function was estimated and agricultural real worker price was found to be effective on chickpea production.

Introduction

The leguminous crops, which have been cultivated around the world for many years, have a great importance in terms of satisfying the need for plant-based protein in human nutrition. Particularly high content of crude protein containing legumes is particularly rich in basic amino acids such as Lysine, Leucine, Isoleucine, A, B vitamins and mineral substances and is especially important in meeting the protein requirements of developing countries (Şehirali, 1988).

Chickpea is a leguminous plant used in human and animal nutrition and green fertilization, both in our country and in the world, especially in the Near East, Far East, Mediterranean, South America and Central American countries (Eser, 1976; Reddy and Singh, 1984; Reddy and Kabbabeh, 1985).

Edible beans- an important food source for low-income people in many developing countries, has also an important place in many family's daily consumption in Turkey (Uzunöz, 2009).

In terms of cultivation area in Turkey, legumes take the second most important place after cereals. Of the nine varieties produced, the most grown are chickpeas, beans and lentils. As of 2017, legumes are cultivated in approximately 0.79 million hectares and constitute 2% of the total cultivated area. In 2017, 1.2 million tons of legumes were produced. While total leguminous cultivation area constitutes 50% of the chickpea cultivation area, 40.3% of the total legumes production is chickpea production (TSI, 2019).

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Approximately 84% of the worldwide pulses produced are intended to meet the domestic demand of countries. The remaining 16% is included in world trade (Anonymous, 2017). The chickpea, which is included in the legumes product group, is grown in 2016 in 12.7 million hectares in the world. The country with the highest cultivation area in the world is India with 8.4 million hectares. India is followed by Pakistan with 1.0 million hectares and Australia with 677 thousand hectares. Turkey ranks 7th with 352 thousand hectares (FAO, 2019).

In 2016, the world's production of chickpeas was 12.1 million tons and the average yield was 956 kg ha^{-1}. In World chickpea production, India ranks first with 7.8 million tons of production in 2016, Australia second with 875 thousand tons, Myanmar third with 559 thousand tons, Turkey fourth with 455 thousand tons and Ethiopian fifth with 444 thousand tons. Pakistan ranks second in the cultivation area and ranked seventh with 286 thousand tons of production due to the low yield (304 kg ha^{-1}) (FAO, 2019).

The highest yields in 2016 were China (5177 kg ha^{-1}), Israel (4148 kg ha^{-1}) and Moldova (3945 kg ha^{-1}), respectively. Turkey (1293 kg ha^{-1}) has a yield above the world average (FAO, 2019).

The countries that import chickpea in 2016 are India, Bangladesh, Pakistan, UAE and Algeria, respectively. Turkey ranks 10th in the world chickpea imports with 30 thousand tons (FAO, 2019). The countries exporting chickpeas in 2016 are Australia, Russia, Canada, Argentina and India, respectively. Turkey ranks 11th in export with 23 thousand tons (FAO, 2019).

When it comes to the chickpeas producer prices in 2016, Iraq (1380 $ ton^{-1}), Iran (1330 $ ton^{-1}) and Turkey (958 $ ton^{-1}) have the highest chickpea producer prices respectively, while Bangladesh (503 $ ton^{-1}), Australia (583 $ ton^{-1}) and Mexico (618 $ ton^{-1}) (FAO, 2019) have the lowest producer prices, respectively. In this study, the economic status of chickpea was examined taking into consideration producer-consumer prices and the marketing situation. In addition, factors affecting chickpea production were tried to be measured by estimating the model of chickpea production function.

Materials and Methods

Material

In this study, the production amount of chickpeas, acreage and yield quantities during 2003-2017 period were obtained from Turkish Statistical Institute (TSI) while the producer prices of chickpeas (those which farmers have), retail prices (consumer), and the import-export volumes were taken from TSI, the Food and Agriculture Organization (FAO), the Union of Chambers and Commodity Exchanges of Turkey (UCCET), Turkey Exporters Assembly (TEA), the Institute of Agricultural Economics and Policy Development (IAEPD). The price of fertilizer, fuel price, agricultural worker price was taken from the web site of TSI and IAEPD, while the amount of precipitation was taken from the General Directorate of Meteorology (GDM) website. In addition, various publications and resources were also used.

Method

By considering producer and consumer price indexes (2017 = 100), current prices of chickpea producers and consumers have been converted into real prices. The year-to-year fluctuations in prices were first shown as absolute values, then expressed as a percentage of the first two years of comparison. Averages values were calculated without considering the percentages obtained (Dağdemir and Birinci, 1999; Altundağ and Güneş, 1992). The difference between the prices paid by the farmer (producer prices) and the prices paid by the consumer is calculated as "Marketing Margin" (Aşkan and Dağdemir, 2015; Topcu, 2003).

While calculating the chain price index, the current prices of producers and consumers were calculated comparatively year-by-year-basis by taking into consideration the term between 2003 and 2017. There is no basic year in the chain price index. The index for any year is based on the price of the previous year. The main objective in the chain price index is to examine the annual changes in the price at the time to determine how much the prices would increase or decrease in the next year compared to the previous year (Dağdemir, 1998).

While the model regarding chickpea production function was estimated, the series were tested based on linear, double logarithmic and semi-logarithmic models one by one. In the analysis, double logarithmic model (log-log) fitted best among selected model. Prices were taken into account in real terms (2017 = 100). Durbin-Watson test was used to determine whether there was an autocorrelation problem in the time series analysis of the established models and no autocorrelation problem was found.

The estimated model for chickpea production function is as in formula 1.

$$LogCPA_{(t)}: \alpha + \beta_1 \, LogFP + \beta_2 \, LogLP + \beta_3 \, LogDP + \beta_4 \, D + \in \qquad (1)$$

CPA: Chickpea Production Amount (ton)

FP: Fertilizer Reel Price (TL ton^{-1})

LP: Agricultural Labor Real Price (TL per month)

DP: Diesel Reel Price (TL lt^{-1})

D: Dummy Variable (The average rainfall for the years 2003-2017 is 627.3 mm. According to years "0" below the average, "1" above the average was accepted.)

Results and Discussion

In Turkey, 600 thousand tons of chickpea production were obtained in 0.63 million hectares in 2003, acreage was reduced to about 0.4 million hectares with a decline of 59% in 2017, and production declined to 470 thousand tons with 28% decrease. In contrast to the decline in production areas and production, the average increase in yield has increased from 950 kg ha^{-1} to 1190 kg ha^{-1}. Between 2003 and 2017, the average planting area was 468.5 thousand hectares, the average production was 522.3 thousand tons and the average yield was 1130 kg ha^{-1}. The year with the highest yield was 2015 with 1280 kg ha^{-1}, while the lowest yield was in 2003 with 950 kg ha^{-1} (Table.1).

Table 1. Chickpea plantings, production and yield condition in Turkey (2003-2017)

Years	Planting Area (ha)	Quantity (ton)	Yield (kg ha^{-1})
2003	630 000	600 000	952
2004	606 000	620 000	1023
2005	557 800	600 000	1075.6
2006	524 367	551 746	1052.2
2007	503 675	505 366	1003.4
2008	505 165	518 026	1025.5
2009	455 934	562 564	1233.9
2010	455 690	530 634	1164.5
2011	446 413	487 477	1092
2012	416 242	518 000	1244
2013	423 557	506 000	1194.6
2014	388 518	450 000	1158.2
2015	359 304	460 000	1280.2
2016	359 529	455 000	1265.5
2017	395 310	470 000	1188.9
Average	**466 500**	**522 320.9**	**1130.23**

Source: TSI, 2019

In 2017, the total consumption of chickpea was 536 955 tons. In 2003, per capita consumption was 6.11 kg per year, and 6.64 kg per year in 2017. The highest average consumption rate of chickpea was 7.17 kg in 2004 and the lowest in 2016 with 5.79 kg. The average consumption in Turkey between the years 2003 and 2017 seems close. Average consumption is kept close to each other because of the decrease in production (28%), increase in productivity (25%) and imports (22000%) between 2003-2017 (Table 2).

While the chickpea qualification rate was 98.3% in 2016, it decreased by 87.5% in 2017. Between the years of 2003-2017, the export average is 67 540 tons, while the import is 21 887 tons (Table 2).

Table 2. Chickpea production, consumption and marketing in Turkey (2003-2017)

Years	Production (ton)	Consumption (ton)	Per Capita Consumption (kg/year)	İmports (ton)	Exports (ton)
2003	600 000	410 399	6.11	41	189 642
2004	620 000	487 473	7.17	546	133 073
2005	600 000	477 053	6.93	646	123 593
2006	551 746	448 943	6.44	1 881	104 684
2007	505 366	441 350	6.25	5 176	69 192
2008	518 026	438 449	6.13	8 760	88 337
2009	562 564	478 459	6.59	4 404	88 509
2010	530 634	481 427	6.53	7 586	56 793
2011	487 477	467 723	6.26	8 451	28 205
2012	518 000	527 602	6.98	34 939	25 337
2013	506 000	543 875	7.09	56 875	19 000
2014	450 000	473 000	6.09	41 000	18 000
2015	460 000	474 834	6.03	37 306	22 472
2016	455 000	462 471	5.79	30 446	22 975
2017	470 000	536 955	6.64	90 241	23 286

Source: Original calculations

In general, chickpea prices are on an upward trend. Producer prices of chickpeas, which were 1.13 TL kg^{-1} in 2003 in current prices, increased by 483% and became 5,46 TL kg^{-1} in 2017. In consumer prices, the price of 1.62 TL kg^{-1} in 2003 increased by 555% to 9 TL kg^{-1} in 2017. The highest increase in chickpea producer prices was 48% in 2017 up from 3.68 TL kg^{-1} to 5.46 TL kg^{-1} over the previous year. The highest increase in consumer price increased by 32% in 2012 and prices increased from 4.76 TL kg^{-1} to 6.28 TL kg^{-1} (Table 3).

The marketing margin is the difference between the price paid by the consumer and received by the producer for one kg of chickpeas. In other words, the marketing margin is the value taken by intermediaries. When the current prices are taken into consideration, the rates reached by the intermediaries according to the years vary between 28% and 59% and the rates obtained by the farmers vary between 41% and 72% (Table 3).

Table 3. Chickpea marketing margins by current prices in Turkey (2003-2017)

Years	Producer Prices (TL kg^{-1})	Consumer Prices (TL kg^{-1})	Marketing Margin	Passing the Producer (%)	Passing the Tool (%)
2003	1.13	1.62	0.49	70	30
2004	1.25	1.74	0.49	72	28
2005	1.27	2.28	1.01	56	44
2006	1.14	2.63	1.49	43	57
2007	1.24	2.94	1.70	42	58
2008	1.49	3.37	1.88	44	56
2009	1.44	3.35	1.91	43	57
2010	1.60	3.61	2.01	44	56
2011	2.11	4.76	2.65	44	56
2012	2.68	6.28	3.60	43	57
2013	2.46	6.03	3.57	41	59
2014	2.33	5.39	3.06	43	57
2015	2.61	6.00	3.39	44	56
2016	3.68	7.25	3.57	51	49
2017	5.46	9.00	3.54	61	39

Source: Original calculations

When the real prices of chickpea are examined, the producer real price of chickpea was 3.53 **TL kg⁻¹** in 2003 and 5.46 **TL kg⁻¹** in 2017. When the consumer real prices are analyzed, the consumer real price, which was 4.84 **TL kg⁻¹** in 2003, was determined as 9.00 **TL kg⁻¹** in 2017. Consumers' chickpea buying parity decreased by 86%. The producer's earnings from 1 kg chickpea production increased by 55% over the course of fifteen years. The figure that the consumer pays for 1 kg of chickpea has increased by %86. In the five-year period, it was in favor of the producers in real terms and against the consumer (Table 4).

According to the current prices of chickpea, producer and consumer chain indexes were calculated and compared with the inflation rates in table 5. As a result of this comparison, it was determined that the prices of chickpeas remained below the inflation rate in 2004, 2005, 2006, 2009, 2013 and 2014. In 2004, 2009, 2013 and 2014, the purchasing power of the consumers increased and decreased in other years.

Table 4. Chickpea marketing margins by real prices in Turkey (2003-2017)

Years	Producer Prices (TL kg⁻¹)	Consumer Prices (TL kg⁻¹)	Marketing Margin	Passing the Producer (%)	Passing the Tool (%)
2003	3.53	4.84	1.31	73	27
2004	3.59	4.70	1.11	76	24
2005	3.37	5.69	2.31	59	41
2006	2.76	5.98	3.21	46	54
2007	2.76	6.29	3.52	44	56
2008	3.01	6.39	3.39	47	53
2009	2.74	6.28	3.54	44	56
2010	2.80	6.23	3.43	45	55
2011	3.47	7.40	3.93	47	53
2012	4.04	9.20	5.16	44	56
2013	3.45	8.45	5.00	41	59
2014	3.00	6.85	3.85	44	56
2015	3.13	7.25	4.12	43	57
2016	4.09	8.40	4.31	49	51
2017	5.46	9.00	3.54	61	39

Source: Original calculations

Table 5. According to chickpeas producer-consumer chain indexes in Turkey the current prices and annual inflation rates

Years	Producer Chain Index	Producer Index Difference	Producer Price Index	Consumer Chain Index	Consumer Index Difference	Consumer Price Index
2003	100	-	13.9	100	-	18.4
2004	110.6	10.6	13.8	107.4	7.4	9.3
2005	101.6	1.6	2.7	131	31	7.7
2006	89.7	-10.3	11.6	115.4	15.4	9.7
2007	108.7	8.7	5.9	111.8	11.8	8.4
2008	120.1	20.1	8.8	114.6	14.6	10.1
2009	96.6	-3.4	5.9	99.4	-0.6	6.5
2010	111.1	11.1	8.9	107.8	7.8	6.4
2011	131.8	31.8	13.3	131.9	31.9	10.5
2012	127	27	2.5	131.9	31.9	6.2
2013	91.7	-8.3	7.0	96	-4	7.4
2014	94.7	-5.3	6.4	89.4	-10.6	8.2
2015	112	12	5.7	111.3	11.3	8.8
2016	140.9	40.9	9.9	120.8	20.8	8.5
2017	148.4	48.4	15.5	124.1	24.1	11.9

Source: Original calculations

According to the signs determined by the chickpea production function, it is observed that there is an inverse relationship between the production of chickpeas and the real price of fertilizer and the real price of agricultural workers, and there is a correct relation between diesel real price and rainfall amount (dummy). It is seen that there is a correct relationship between chickpea production and diesel real price and it does not comply with economic theory. As a result of the use of time series data, the signs of the coefficients may have negative results.

In the model, the value of R² was high (0.810) and according to the F test, the predicted model for chickpea production function was statistically significant at 1% (P=0.001) significance level. Again, the real price of agricultural workers from the independent variables was statistically significant at the significance level of 1% and it was found that other independent variables were insignificant. When we increase agricultural labor costs by 1% according to the agricultural labor coefficient in the model, a decrease of 0.373% in

chickpea production is foreseen.

The Ministry of Agriculture and Forestry supports the farmers with diesel and fertilizer. It is observed that these two inputs are not effective in the production model. Again, it is seen that the increase in the amount of precipitation enhances the production of chickpeas, which is statistically insignificant.

Table 6. Regression analysis results about chickpea production function

LogCPA	Coefficients		Standard Error	P (t)	P (F)
α	15.7454	***	0.6015	0.000	
LogFP	-0.1019		0.1142	0.393	
LogLP	- 0.3730	***	0.0772	0.001	0.001
LogDP	0.1155		0.1541	0.471	
D	0.0078		0.3260	0.816	

***, **, * ==> Significance at 1%, 5%, 10% level

Conclusion

In chickpeas, there was an increase in the amount of consumption due to the population increase. On the contrary, there has been a decrease in production amount over the years. There has been a decrease in exports and an increase in imports by years. Over the past fifteen years, Turkey has decreased to position importer from an exporter in chickpeas. Diesel and fertilizer support are given to farmers by the Ministry of Agriculture and Forestry and it has been determined that it is not effective in increasing production. In order to reach the self-sufficiency level in chickpeas, different policies should be implemented.

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