

ANALYSIS OF PRODUCTION AND TRADE OF CHICKPEA IN TURKEY AND THE WORLD

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Abstract

In this study, the changes in world's and Turkish chickpea market were discussed. The data used in this study were obtained from FAO (Food and Agricultural Organisation) and TÜİK (Turkish Statistical Service) for the 1980-2016 periods. According to the data collected, world's production of chickpea has increased due to an expansion of sown area and yield have also experienced a massive increment of 1.90 times over the period. In the world, Turkey is ranked 5th out of the world's total production of chickpea. Turkey is placed seventh and 52nd in sown area and yield in the world. The trade of chickpea has seen significant development in the world. Thus, over the above mentioned period, export of chickpea quantity increased by 6.88 times, value by 10.34 times. Over the period, the chickpea production of Turkey has increased due to the expansion of the planting area. The chickpea production is being carried out intensively in the following provinces of Turkey, Antalya, Uşak, Konya, Karaman, Mersin, Kırşehir, Kütahya, Yozgat, Ankara, and Isparta provinces are also well known in the production of the chickpea. Turkey's production share and export have decreased. Recently, Turkey is not self-sufficient in the chickpea production. In this respect, especially the increased production of the chickpea sector, this is an essential point of policy regarding the development and improvements.

Key words: chickpea, market, trade, price, Turkey

INTRODUCTION

Chickpea (*Cicer arietinum* L) is a plant rich in nutrients and consumed almost everywhere in the world. Chickpea is an essential cultural plant of the Fabaceae family. It contains protein content (16.4-31.12%) and regarding carbohydrate values in Turkey and is an essential crop regarding meeting the needs of protein in the diet against the growing population in the world [14]. In addition to being consumed as food, it is an agricultural industry product that can be used both as roasted chickpea and as an animal food [1] [2] [12] [8]. Chickpea is also used as an ingredient of sweet type natural yeast for making traditional bread [6]. Chickpea is generally used in gluten-free food formulations such as for production of gluten free-bread [5].

In the world, chickpea has an essential place in total legume production. India is in the first place regarding chickpea harvested area and production. The fact that histidine amino acid,

which is essential in the digestion of protein in chickpeas and the feeding of children, is higher in the chickpea protein than in the mother's milk leads to the separate importance of this food. It is also rich in mineral substances such as calcium, iron, and phosphorus. A, B and C group vitamins, as well as a rich appetiser with roasted chickpeas and edible grain consumption in Turkey, is quite common [3].

This study aimed to analyse the situation of chickpeas in Turkey and the world. These objectives were the development and compared of chickpea harvested areas, production, yield, consumption, and the export-import situation in the world and Turkey. Moreover, also provinces in Turkey were evaluated on the basis of developments in chickpeas production.

MATERIALS AND METHODS

The primary material of the study was FAO, TURKSTAT statistical data. In this context,

the 1980-2016 year, chickpea harvested area, yields, production, import and export data in some countries with the data in some provinces of Turkey were evaluated.

Five-year averages of data were obtained since 1980. This data calculated index was analysed using ratios.

The current prices of chickpea were converted to real values in 2016 using the Producer Price Index (UFE; 2016 = 100) calculated by TURKSTAT. Thus, over the years, the changes in prices, their developments, and the causes were tried to be revealed.

Gujarati [10] and Greene [9] defined regression analysis as the estimation of the linear relationship between a dependent variable and one or more independent variables or covariates. The primary goal of regression analysis is to model the various factors which cause variations of the dependent variable [9] [10].

We used the multiple regression analysis to identify the factors that affect chickpea harvested area of Turkey. The regression model in its implicit form was given as:

$$Y = F(X_1, X_2, U) \quad [9] \quad [10] \quad (1)$$

where Y = Harvested area of chickpea (ha)

X₁ = Chickpea yield a year ago (kg)

X₂ = the farmer's real price of chickpea two years ago (TRY)

U = Error term.

Logarithmic function was used to calculate the model. Logarithmic regression model was:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + U \quad (2)$$

RESULTS AND DISCUSSIONS

Firstly, the developments in the total world pulses production 2014-2016 averages, and their shares were examined. World total pulses production was estimated to have increased by 75 percent (Fig. 1) from the 45 million tonnes in 1980/84 to 79 million tonnes in 2014/16. The highest share in total pulses production was 34.3% of dry beans. This share was followed by peas dry with 16.0% and chickpeas with 15.4%.

Turkey total pulses production was estimated to have decreased by 1.3 percent (Fig. 1) from the 112.2 thousand tonnes in 1980/84 to 110.8 thousand tonnes in 2014/16. The decline in Turkey production could be attributed to the erratic rainfall and severe harmattan related weather conditions which prevailed mostly during the period. The highest share in Turkey's total pulses production was 41.1% of chickpeas. Lentil followed this share with 32.2% and dry beans with 20.6%.

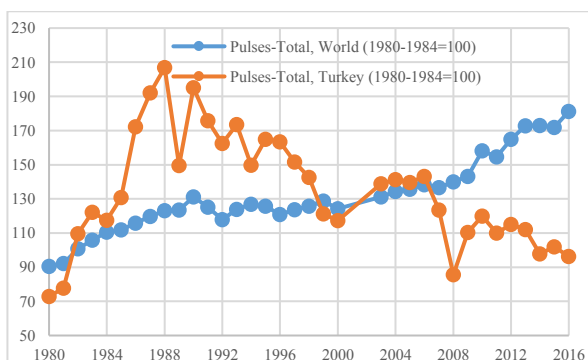


Fig. 1. Development of total pulses production

Source: FAOSTAT [4].

Chickpea is grown in 59 countries around the world. When world chickpea production is examined between 1980 and 2016; the production of chickpeas, which was 6.1 million tons in the 1980-1984 period, increased 1.90 times compared to the base period in 2015-2016. Moreover, world chickpea production reached approximately 11.5 million tonnes (Table 1). The most important producer of chickpea in the world is India (with a significant share of 65.5%). Important other countries in the production of chickpeas were Australia, Myanmar, Ethiopia, Turkey, Pakistan, Russia, Iran, Mexico, USA, and Canada. In the investigated periods in which chickpea production was considered, Australia was the country that increased the most (376 times) followed by Russian Federation (268 times more) (Table 1). India's share in world chickpea production has declined by 7.9% over the years covered, while Australia's share has increased by 6.2%. Turkey accounts for 4% of the world chickpea production. In the considered period, Turkey has increased production of chickpeas, but it appears to other countries and because of the

increase chickpea production in world production rate less than the rate of decrease of share in the world.

In the study direction, chickpea cultivation areas in the world were also examined. World

chickpea harvested area in 1980 - 1984 was about 9.8 million hectares, increased about 1.26 times in the period of 2015-16 and increased to 12.3 million hectares (Table 2).

Table 1. Chickpea production

| Country | 1980-1984 | 1985-1989 | 1990-1994 | 1995-1999 | 2000-2004 | 2005-2009 | 2010-2014 | 2015-2016 |
|----------------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| Production (tonnes) | | | | | | | | |
| India | 4,473,260 | 4,727,140 | 4,618,440 | 5,982,660 | 4,880,160 | 6,037,420 | 8,352,500 | 7,574,492 |
| Australia | 1,900 | 69,678 | 169,893 | 238,394 | 185,105 | 279,837 | 623,291 | 714,997 |
| Myanmar | 118,991 | 139,796 | 89,012 | 83,780 | 195,200 | 353,980 | 515,000 | 565,445 |
| Pakistan | 391,380 | 486,080 | 472,740 | 659,500 | 521,980 | 680,180 | 498,411 | 448,150 |
| Turkey | 283,000 | 643,100 | 775,000 | 673,400 | 590,600 | 547,540 | 498,422 | 457,500 |
| Ethiopia | 121,352 | 88,804 | 92,456 | 132,192 | 165,190 | 250,571 | 400,239 | 482,556 |
| Russian Federation | - | - | - | 800 | 10,500 | 25,600 | 78,062 | 214,954 |
| Iran (Islamic Republic of) | 112,410 | 125,557 | 259,119 | 277,051 | 278,017 | 239,973 | 191,747 | 185,299 |
| Mexico | 158,468 | 154,682 | 162,057 | 197,160 | 208,462 | 148,584 | 171,508 | 129,688 |
| United States of America | - | - | 8,337 | 23,269 | 43,699 | 60,573 | 125,555 | 110,991 |
| Canada | - | - | 1,684 | 51,520 | 221,160 | 126,880 | 133,540 | 95,200 |
| Others | 431,201 | 436,065 | 441,149 | 473,420 | 490,375 | 386,523 | 550,878 | 585,318 |
| World | 6,091,964 | 6,870,904 | 7,089,887 | 8,793,146 | 7,790,447 | 9,137,661 | 12,139,153 | 11,564,589 |
| Index (1980-1984=100) | | | | | | | | |
| India | 100 | 106 | 103 | 134 | 109 | 135 | 187 | 169 |
| Australia | 100 | 3,667 | 8,942 | 12,547 | 9,742 | 14,728 | 32,805 | 37,631 |
| Myanmar | 100 | 117 | 75 | 70 | 164 | 297 | 433 | 475 |
| Pakistan | 100 | 124 | 121 | 169 | 133 | 174 | 127 | 115 |
| Turkey | 100 | 227 | 274 | 238 | 209 | 193 | 176 | 162 |
| Ethiopia | 100 | 73 | 76 | 109 | 136 | 206 | 330 | 398 |
| Russian Federation | - | - | - | 100 | 1,313 | 3,200 | 9,758 | 26,869 |
| Iran (Islamic Republic of) | 100 | 112 | 231 | 246 | 247 | 213 | 171 | 165 |
| Mexico | 100 | 98 | 102 | 124 | 132 | 94 | 108 | 82 |
| United States of America | - | - | 100 | 279 | 524 | 727 | 1,506 | 1,331 |
| Canada | - | - | 100 | 3,060 | 13,136 | 7,536 | 7,932 | 5,655 |
| Others | 100 | 101 | 102 | 110 | 114 | 90 | 128 | 136 |
| World | 100 | 113 | 116 | 144 | 128 | 150 | 199 | 190 |
| Share (%) | | | | | | | | |
| India | 73.4 | 68.8 | 65.1 | 68.0 | 62.6 | 66.1 | 68.8 | 65.5 |
| Australia | 0.0 | 1.0 | 2.4 | 2.7 | 2.4 | 3.1 | 5.1 | 6.2 |
| Myanmar | 2.0 | 2.0 | 1.3 | 1.0 | 2.5 | 3.9 | 4.2 | 4.9 |
| Pakistan | 6.4 | 7.1 | 6.7 | 7.5 | 6.7 | 7.4 | 4.1 | 3.9 |
| Turkey | 4.6 | 9.4 | 10.9 | 7.7 | 7.6 | 6.0 | 4.1 | 4.0 |
| Ethiopia | 2.0 | 1.3 | 1.3 | 1.5 | 2.1 | 2.7 | 3.3 | 4.2 |
| Russian Federation | - | - | - | 0.0 | 0.1 | 0.3 | 0.6 | 1.9 |
| Iran (Islamic Republic of) | 1.8 | 1.8 | 3.7 | 3.2 | 3.6 | 2.6 | 1.6 | 1.6 |
| Mexico | 2.6 | 2.3 | 2.3 | 2.2 | 2.7 | 1.6 | 1.4 | 1.1 |
| United States of America | - | - | 0.1 | 0.3 | 0.6 | 0.7 | 1.0 | 1.0 |
| Canada | - | - | 0.0 | 0.6 | 2.8 | 1.4 | 1.1 | 0.8 |
| Others | 7.1 | 6.3 | 6.2 | 5.4 | 6.3 | 4.2 | 4.5 | 5.1 |
| World | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: FAOSTAT [4].

According to 1980-1984 period in the period of 2015-2016, Australia (about 290 times) chickpea area was the country that is expanding the cultivation area the most. Also, there was a 48% drop in the area of chickpea in Mexico (Table 2).

World chickpea cultivation seems to have occurred in India as well as in production. India accounts for 67.5% of world chickpea cultivated areas. Pakistan follows this share with 7.9% and Australia with 4.5% share. 2.9% of the world chickpea acreage constitutes Turkey (Table 2).

World chickpea yields increased by 1,640 hg per ha in the period 1980-1984 to 1,540 hg per ha in the period 2015-2016 (Table 3).

Ethiopia is the highest yield country in 2015-2016 with 19,921 hg per ha (Table 3). Canada follows Ethiopia with 17,917 hg per ha, Mexico with 17,738 hg per ha, Myanmar with 15,362 hg per ha, and the USA with 14,549 hg per ha (Table 3). Canada and Australia have a production advantage especially yield per hectare. These countries also become leaders on chickpea export.

When countries compare chickpea yield with world average in selected periods, Ethiopia has 2.1 times more yield than average world chickpea yield. In the 2015-2016 period, Turkey's average yield is 37% higher than the world average yield of chickpea.

Table 2. Chickpea harvested area

| Country | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-04 | 2005-09 | 2010-14 | 2015-16 |
|----------------------------|-----------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | Harvested area (ha) | | | | | | | |
| India | 7,199,420 | 6,853,760 | 6,476,860 | 7,507,600 | 6,140,460 | 7,307,680 | 8,825,800 | 8,291,326 |
| Pakistan | 937,100 | 985,820 | 1,035,280 | 1,092,560 | 951,200 | 1,072,360 | 1,013,922 | 973,677 |
| Australia | 1,900 | 61,918 | 186,717 | 251,483 | 234,103 | 240,387 | 523,919 | 551,122 |
| Iran (Islamic Republic of) | 197,961 | 281,467 | 560,205 | 695,432 | 664,736 | 538,820 | 446,906 | 448,072 |
| Myanmar | 150,611 | 159,891 | 134,451 | 126,343 | 192,469 | 279,719 | 357,662 | 368,091 |
| Russian Federation | - | - | - | 1000 | 11,300 | 26,200 | 79,097 | 228,973 |
| Turkey | 272,594 | 631,311 | 823,265 | 703,311 | 629,375 | 504,161 | 412,468 | 354,455 |
| Ethiopia | 150,756 | 134,600 | 119,722 | 159,142 | 185,408 | 210,507 | 229,735 | 242,047 |
| United States of America | - | - | 6,486 | 17,327 | 31,776 | 41,804 | 74,106 | 76,535 |
| Mexico | 141,161 | 133,129 | 110,975 | 126,422 | 133,008 | 94,007 | 98,548 | 73,351 |
| Canada | - | - | 1,216 | 36,834 | 198,680 | 91,400 | 68,340 | 53,150 |
| Others | 701,522 | 671,918 | 680,993 | 746,686 | 706,882 | 506,664 | 623,165 | 628,134 |
| World | 9,753,026 | 9,913,815 | 10,136,170 | 11,464,139 | 10,079,398 | 10,913,710 | 12,753,668 | 12,288,931 |
| | Index (1980-1984=100) | | | | | | | |
| India | 100 | 95 | 90 | 104 | 85 | 102 | 123 | 115 |
| Pakistan | 100 | 105 | 110 | 117 | 102 | 114 | 108 | 104 |
| Australia | 100 | 3,259 | 9,827 | 13,236 | 12,321 | 12,652 | 27,575 | 29,006 |
| Iran (Islamic Republic of) | 100 | 142 | 283 | 351 | 336 | 272 | 226 | 226 |
| Myanmar | 100 | 106 | 89 | 84 | 128 | 186 | 237 | 244 |
| Russian Federation | - | - | - | 100 | 1,130 | 2,620 | 7910 | 22,897 |
| Turkey | 100 | 232 | 302 | 258 | 231 | 185 | 151 | 130 |
| Ethiopia | 100 | 89 | 79 | 106 | 123 | 140 | 152 | 161 |
| United States of America | - | - | 100 | 267 | 490 | 644 | 1,142 | 1,180 |
| Mexico | 100 | 94 | 79 | 90 | 94 | 67 | 70 | 52 |
| Canada | - | - | 100 | 3,030 | 16,344 | 7,519 | 5,622 | 4,372 |
| Others | 100 | 96 | 97 | 106 | 101 | 72 | 89 | 90 |
| World | 100 | 102 | 104 | 118 | 103 | 112 | 131 | 126 |
| | Share (%) | | | | | | | |
| India | 73.8 | 69.1 | 63.9 | 65.5 | 60.9 | 67.0 | 69.2 | 67.5 |
| Pakistan | 9.6 | 9.9 | 10.2 | 9.5 | 9.4 | 9.8 | 8.0 | 7.9 |
| Australia | 0.0 | 0.6 | 1.8 | 2.2 | 2.3 | 2.2 | 4.1 | 4.5 |
| Iran (Islamic Republic of) | 2.0 | 2.8 | 5.5 | 6.1 | 6.6 | 4.9 | 3.5 | 3.6 |
| Myanmar | 1.5 | 1.6 | 1.3 | 1.1 | 1.9 | 2.6 | 2.8 | 3.0 |
| Russian Federation | - | - | - | 0.0 | 0.1 | 0.2 | 0.6 | 1.9 |
| Turkey | 2.8 | 6.4 | 8.1 | 6.1 | 6.2 | 4.6 | 3.2 | 2.9 |
| Ethiopia | 1.5 | 1.4 | 1.2 | 1.4 | 1.8 | 1.9 | 1.8 | 2.0 |
| United States of America | - | - | 0.1 | 0.2 | 0.3 | 0.4 | 0.6 | 0.6 |
| Mexico | 1.4 | 1.3 | 1.1 | 1.1 | 1.3 | 0.9 | 0.8 | 0.6 |
| Canada | - | - | 0.0 | 0.3 | 2.0 | 0.8 | 0.5 | 0.4 |
| Others | 7.2 | 6.8 | 6.7 | 6.5 | 7.0 | 4.6 | 4.9 | 5.1 |
| World | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: FAOSTAT [4].

Table 3. Chickpea yield

| Country | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-04 | 2005-09 | 2010-14 | 2015-16 |
|----------------------------|-------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | Yield (hg per hectares) | | | | | | | |
| Ethiopia | 8,042 | 6,733 | 7,730 | 8,454 | 8,917 | 11,884 | 17,374 | 19,921 |
| Canada | - | - | 8,410 | 13,465 | 11,541 | 14,906 | 19,466 | 17,917 |
| Mexico | 11,264 | 11,538 | 14,612 | 15,423 | 15,335 | 15,937 | 16,892 | 17,738 |
| Myanmar | 7,550 | 8,647 | 6,576 | 6,715 | 10,028 | 12,581 | 14,374 | 15,362 |
| Australia | 4,166 | 11,473 | 9,537 | 9,824 | 7,972 | 11,582 | 12,111 | 12,992 |
| USA | - | - | 10,225 | 13,397 | 13,580 | 14,652 | 16,925 | 14,549 |
| Turkey | 10,612 | 10,308 | 9,392 | 9,560 | 9,388 | 10,891 | 12,083 | 12,908 |
| Russian Federation | - | - | - | 3,333 | 9,280 | 10,366 | 9,818 | 9,969 |
| India | 6,212 | 6,866 | 7,140 | 7,959 | 7,915 | 8,250 | 9,464 | 9,133 |
| Iran (Islamic Republic of) | 5,921 | 4,449 | 4,657 | 3,951 | 4,220 | 4,326 | 4,253 | 4,135 |
| Pakistan | 4,241 | 4,916 | 4,563 | 6,033 | 5,461 | 6,341 | 4,913 | 4,585 |
| World | 6,244 | 6,913 | 6,995 | 7,669 | 7,715 | 8,363 | 9,516 | 9,407 |
| | Index (1980-1984=100) | | | | | | | |
| Ethiopia | 100 | 84 | 96 | 105 | 111 | 148 | 216 | 248 |
| Canada | - | - | 100 | 160 | 137 | 177 | 231 | 213 |
| Mexico | 100 | 102 | 130 | 137 | 136 | 141 | 150 | 157 |
| Myanmar | 100 | 115 | 87 | 89 | 133 | 167 | 190 | 203 |
| Australia | 100 | 275 | 229 | 236 | 191 | 278 | 291 | 312 |
| USA | - | - | 100 | 131 | 133 | 143 | 166 | 142 |
| Turkey | 100 | 97 | 88 | 90 | 88 | 103 | 114 | 122 |
| Russian Federation | - | - | - | 100 | 278 | 311 | 295 | 299 |
| India | 100 | 111 | 115 | 128 | 127 | 133 | 152 | 147 |
| Iran | 100 | 75 | 79 | 67 | 71 | 73 | 72 | 70 |
| Pakistan | 100 | 116 | 108 | 142 | 129 | 150 | 116 | 108 |
| World | 100 | 111 | 112 | 123 | 124 | 134 | 152 | 151 |

Source: FAOSTAT [4].

In the period 1980-1984 world chickpea exports 237 thousand tons and by the year 2013 world chickpea exports increased 6.88 times to 1.63 million tons.

When the developments in countries exporting chickpeas were examined, the most massive increase in 2013 (from 1980 to 2013) took place in Ethiopia with about 46,879

times. Russia followed Ethiopia with an increase of 5,697 times and Canada with an increase of 640 times.

Turkey's chickpea exports in 2013 (compared to the period 1980-1984) was down 87%.

The 33.8% of world chickpea exports were in Australia, 24.6% in India and 11.0% in Russia. Turkey exported a rate of less than 1.2% of world exports chickpeas.

World exports of chickpeas rose to \$ 111 million in the 1980-84 period, \$ 204 million in the 1990-94 period, \$ 595 million in the 2005-09 period and \$ 1.15 billion in the year 2013.

Countries with high chickpea export values continue to be India, Australia, Mexico, and Russia. In 2013, India increased by about 1,032 times to 348 million dollars. In 2013, the most significant increase in the value of chickpeas exported over the 1980-84 period was in Ethiopia. Turkey's export value showed a 67% decline in 2013.

The amount of world chickpea import increased from 149 thousand tons in the 1980-1984 period to 10.61 million tons in 2013. When the developments in the country's imports of chickpeas were examined, in 2013 (according to the 1980 to 1984 period) Turkey's import was the most massive increase with 7,109 times. Bangladesh's chickpeas import was a 423-fold increase, followed by a 136-fold increase in India. Turkey 1980-1984 period, while imports do not do chickpeas, were imported 56,875 tons in 2013.

India was imported 33.4% of the world's chickpea, 12.7% in Bangladesh and 6.8% in Algeria.

When the world imports of chickpeas were evaluated as worth, the import value of about 95 million dollars in the 1980-84 period rose to 225 million dollars in the 1990-94 period, 623 million dollars in the 2005-09 period and 1.28 billion dollars in the year 2013. Countries with high imports of world chickpeas continue to be India, Algeria, Bangladesh, and Spain.

The value of imports of chickpeas, which was \$ 1 million in the 1980-84 period of India, rose to \$ 43 million in the 1995-99 period and rose to 323 million dollars in 2013. In 2013,

the most significant increase compared to the 1980-84 period had been worth chickpea imports about 39,115 fold in Turkey.

Turkey and the world export quantity of chickpeas share in the production were given in Fig. 2. According to this, 12.3% of the chickpeas produced in the world in 2013 is subject to export. In the world between 1980 and 2013, this rate varied between 3.4% and 16.5%, with an average of 8.1%. This ratio is continuing to increase in the world. Turkey's chickpea exports amount share in the production was 3.8% by 2013. In Turkey, this ratio ranged from 3.8% to 73.2% in the years 1980-2013, the average was realised as 29.2%. This rate was the highest value for Turkey in 1981 (73.2%) had received. From this year onwards, it has tended to decrease (Fig. 2).

Australia and Russian Federation important export countries and they exported nearly all their produced chickpeas. Mexico, Canada and USA also become important export countries, and they exported above/nearly half of their chickpeas production. The domestic consumption of chickpea is low in these countries. Their markets are generally Asia and the Middle East.

Turkey's imports of chickpea began in 1989. The share of world imports of chickpeas has also increased over the years examined. Turkey chickpeas in the world regarding import value rose to ninth place. Chickpea major exporter of Turkey in recent years has lost its situation. Turkey's export volume of chickpea showed an upward trend until the period 1980-1989 (average 225 thousand tons), the average realised export 206 thousand tons in 1990-1999 periods, and it has a tendency to decrease after 1994. The share of world chickpeas export amount has been declining. Turkey's export amount of chickpeas 2000-2013 period, the average has dropped to 88 thousand tons. After 2010, it exported less than 30 thousand tonnes. Especially after 2009 and chickpeas Turkey's share in world export volume dropped below 8% after the year 2012 also declined below 2%.

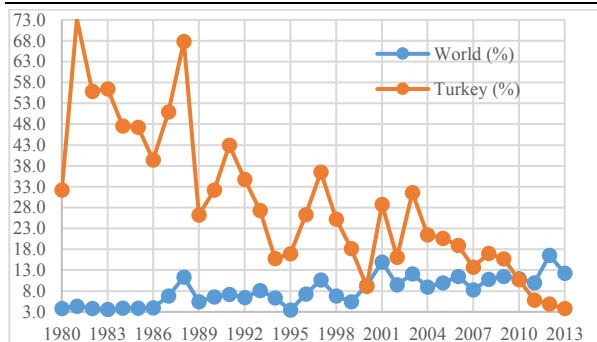


Fig. 2. World and Turkey's chickpea export volume share in production (%)
Source: FAOSTAT [4].

According to the 1980-1984 period, the amount of world chickpea imports increased by about 14 times and import value increased by about 15 times. In this, it can be said that besides world trade volume, higher prices of chickpeas are effective. The same is right for world chickpea export quantity and value. According to the baseline period, world chickpea export quantity increased 8.73 times in 2013 and chickpea export value increased by 10.7 times. Therefore, it can be said that the world chickpea export quantity is increased in volume, and the increase in chickpeas export prices is more effective in this. As the year's chickpeas, export value increased in the world, while Turkey has fluctuated in the 2000s. Indeed, Turkey's share declined to 10th.

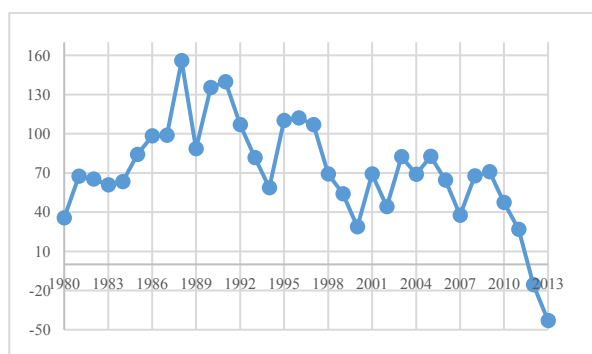


Fig. 3. Turkey trade balance (million \$)
Source: FAOSTAT[4].

Turkey's chickpea export-import amount and Turkey's chickpea export-import values difference was given in Fig. 3 and Fig. 4, in this case, it was more clearly understandable. Turkey's difference in the amount of export-import chickpeas was around 225 thousand tons in the 1980-1989 and decreased to 77

thousand tons in 2000's, implements the -38 thousand tons in 2013. Turkey's difference chickpeas export-import value was 82 million \$ in 1980-1989, while 45 million \$ in the 2000s, then declined to 43 million \$ in 2013.

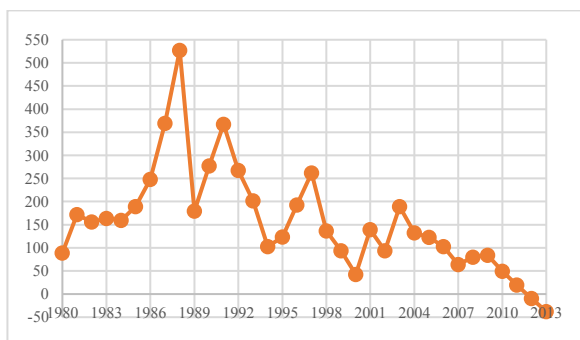


Fig. 4. Turkey trade balance (thousand tonnes)
Source: FAOSTAT [4].

The producers' real prices of chickpea have fluctuated based on the supply-demand balance in 1982-2016 in Turkey (Fig. 5).

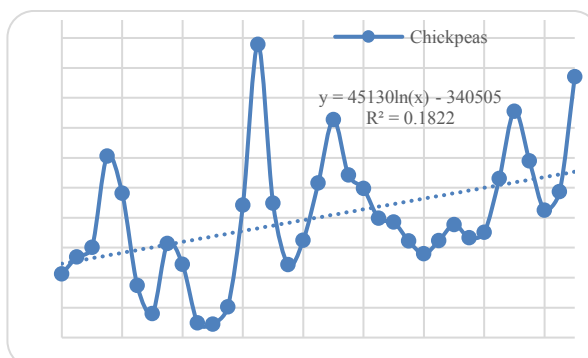


Fig. 5. Real Prices of Chickpeas (1982-2016, TRY/tons) in Turkey
Source: Own design.

It could be said that these had been felt more in chickpeas producers and decreased or fluctuated on farmers' net profit. Reducing the production costs to the minimum level or increasing the yield potential in this situation are the ways of the farmer. However, this is hardly achieved due to the nature of agricultural products.

In Fig. 6, the change of some pulses real prices were given as % (according to the average of 1982-1984 years). Not only in chickpea but also in lentils and dry beans prices fluctuated between 1982-2016. However, the coefficient of variation was higher in chickpeas, followed by lentils.

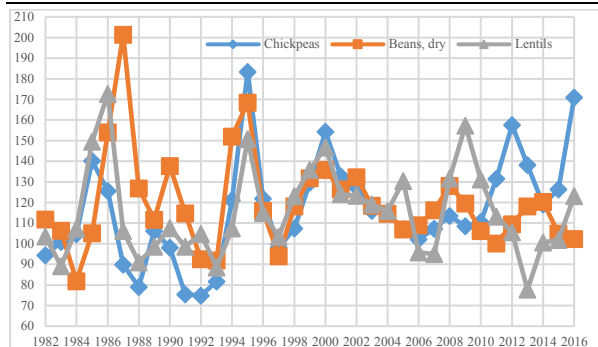


Fig. 6. Change of real prices of some pulses (1982-2016, TRY/tons) in Turkey
Source: TÜİK [13]

We used regression analysis to determine the factors that affect the harvested area of chickpea production in Turkey. The dependent variable was the quantity of chickpea harvested area Y (ha) in the model specified. The independent variables were chickpea yield a year ago (X_1) and farmers' real price of chickpea two years ago (X_2) in a function. The summary of the model result was given in Table 4 below.

The calculated logarithmic model can be expressed as:

$$\ln Y = 18.627 - 0.869 \ln X_1 + 0.342 \ln X_2$$

The value of the coefficient of determination R^2 was amounted to be 0.518 (51.8%), and this parameter was indicated that the independent variables in the model could explain about 52 percent of the variation in chickpea harvested areas. The F-test was statistically significant at the 1% level ($F_{\text{calculated}} > F_{\text{table}}$, $20.368 > 3.32$). These parameters indicate that the calculated model can be used for the prediction purpose. Chickpea yield and farmer's chickpea real price identify as the significant factors affecting the harvested area of chickpea production in Turkey. The yield a year ago (X_1) had a negative coefficient. The decrease in this parameter will result in a decrease of 0.869 units in the area of chickpea cultivation. However, the real price two years ago (X_2) had a positive coefficient. The value of the coefficient was calculated to be 0.342. This score shows that a unit increase in real price will lead to an increase of 0.342 units in the area of chickpea cultivation (Table 4).

Table 4. Regression analysis result

| | Constant | X_1 | X_2 | F test | R^2 |
|----------------|----------|--------|-------|--------|-------|
| Coefficient | 18.627 | -0.869 | 0.342 | | |
| Standard error | 3.039 | 0.315 | 0.066 | | |
| t-values | 6.129 | -2.756 | 5.205 | 20.368 | 0.518 |

Source: own calculation.

Turkey ranks fifth in chickpea production, ranked seventh in chickpea acreage, while in chickpea yield ranks fifty-second in the world. Ten provinces; Antalya, Istanbul, Konya, Karaman, Mersin, Kirsehir, Kutahya, Istanbul, Ankara, and Isparta, were the most chickpeas producers in Turkey. Antalya is produced 34,918 tonnes of chickpea in Turkey with 7.6% shares. Usak follows Antalya with 30,937 tons and 6.7% shares, Konya with 29,747 tons and 6.5% shares, Karaman with 29,358 tons and 6.4% shares and Mersin with 27,131 tons and 5.9% shares, respectively. Kirsehir has increased its production by 4.67 times in comparison with 1991-95 period. Uşak, Konya, Yozgat, and Isparta chickpea productions decreased by 20% to 59% compared to the 1991-95 period. The decline in sowing area was effective in this downfall. There are many diseases, pests, and weeds in places where leguminous farming is carried out. Among them, anthracnose (*Ascochyta rabiei*) stands out as the most critical disease, while *Liriomyza cicerina* also stands out as a critical harmful agent [11].

Chickpeas consumption ranged from 4.5 kg to 6.0 kg per capita in Turkey. Turkey is not self-sufficient in the chickpeas in recent years. Gül and Işık [7] examined the developments total pulses production and trade in the world and Turkey as compared to the period 1961-2000.

Gül and Işık [7] reported that beans, peas and chickpeas production in total pulses have an essential share in the world, lentil and chickpeas production have almost all of total pulses production in Turkey. Turkey, an important pulses exporter in the period of review, lost this feature with the decline in pulses cultivation areas in recent years and had become the importer country.

Some projects started in some provinces and regions in Turkey in the 1970s; pulses production has been increasing with the

policies applied [7]. These products have lost their significance in recent years, while they have peaked in exports. In this case, the policies implemented related pulses sector indicates that it should be revised. To sustain the pulses production, taking long-term measures must be established and forward-looking projections.

CONCLUSIONS

In this study, changes in world market chickpeas and Turkey were discussed. Chickpea production increased 2.34 times in the world. This increase was due to the increase in crop area (1.5 times) and the increase in yield (1.5 times). Turkey is in fifth place in the world chickpea production. The share in the world decreased by the beginning of the period, but its production increased by 62%. In Turkey, this increase in production in more acreage (30%) increase was effective. Yield increased by 22%.

Turkey ranks fifth in world production of chickpeas, chickpea acreage in the seventh is located fifty-second in chickpea yield.

The countries that exports most chickpeas are Australia, India, Russia, Canada and the United States. The countries that import most chickpeas are Pakistan, India, Bangladesh, United Arab Emirates and Algeria.

As a result, Turkey in recent years regarding the production of chickpeas is not self-sufficient. It shows fluctuations in the price of chickpeas in Turkey. Worldwide, the price of chickpea has also fluctuated, but it tends to increase. This situation affects farmers' production decision. Usually, the farmer takes into account the prices of the previous year. By such factors as the low yields in Turkey, disease and pest population density, and the natural conditions of production affect the net income of farmers directly. Therefore, the agricultural policies of the product must take these criteria into account.

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