

ANALYSIS OF THE COST AND PROFITABILITY OF IMPORTANT FIELD CROPS IN ISPARTA PROVINCE, TURKIYE

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Abstract

In this study, it was aimed to examine the changes in the cost and profitability of rose (oil), wheat, barley and chickpea, which are important agricultural products in Isparta province. In this context, statistical data of Isparta Provincial Directorate of Agriculture and Forestry and TURKSTAT were utilized. According to the findings of the research, in 2022, rose (oilseed) kg cost was 10.57 TL, relative profit 1.58; wheat kg production cost 6.11 TL, relative profit 1.51; barley kg production cost 4.54 TL, relative profit 1.31 and chickpea kg production cost 14.78 TL, relative profit 1.25. There was a general upward trend in the production costs of the products analyzed. The increase in factors such as diesel, fertilizer, pesticides and harvest labor costs caused the cost of the products to increase. In addition, due to the nature of agriculture, changes in yield with the effect of the climate factor also affected the income of farmers. This reduces the profit margin of producers.

Key words: cost of production, profitability, absolute profit, relative profit, Isparta

INTRODUCTION

Cost is the sacrifice made to obtain a benefit or interest or a certain amount of money disposed of in return for a good [36]. According to another definition, cost is the sum of the expenditures made on the means of production used in the production of a particular good or service [3]. Although the methods used in calculating the costs of agricultural products are similar to each other, even small differences between these similarities cause significant changes in the results. It is seen that there are significant differences especially in interest rates, calculation of costs and distribution of costs to production branches [35] [6]. The cost of agricultural products varies according to the type of product in line with the objectives of the institutions and individuals making the calculation [6]. In agricultural enterprises engaged in mixed production, it is impossible to make plans about the enterprise without business accounting records. Because it is necessary to know the accounting records in order to explain the reasons why the factors of

production used in input costs are used in which ratios and how they affect the result. It will be more effective to find out which production factors provide more effective returns to which production line and to turn to that production line. In addition, the production costs, profitability status and rationality degrees of the enterprise can contribute to production planning more effectively with the help of accounting records [34].

Cost calculations have been made for various products in Isparta province. For example, there are studies on apple by Gül [15]; Gül [16]; Gül et al., [18]; Gül et al., [19]; Demircan et al., [9]; Yılmaz et al., [39]; Bayav and Karlı [4]; on cherry by Gül et al., [17]; Gül et al., [20]; Demircan et al., [8]; on wheat by Gül et al. [12]. There are studies on lavender by Gül et al. [27]; on seedling product by Büyükarıkan and Gül [5]; on bread by Gül et al. [13]. On the other hand, Gül [14], Demircan [7]; Gül et al. [25] conducted studies on oil rose. In addition, there are studies on cost analysis conducted in neighbouring provinces with similar climate

and soil conditions to the research region. These studies include potato production in Afyonkarahisar province [31], almond production [38], grape production [11], tobacco in Uşak province [26] and chickpea [23], tomato production [30], sugar beet production [32], green bean [28], fennel production [29], and anise production in Burdur province [37], thyme production in Denizli province [21] [33], buckwheat production [22], carrot production in Konya province [1] and eggplant production in Antalya province [24].

In Isparta province, wheat (20%) and chickpea (86%) cultivation area decreased while barley (18%) and oil rose planting area (116%) increased between 2003-2022.

Especially in recent years, oil rose production has become attractive for producers due to the increase in the demand for oil rose products of companies.

According to 2003 data, 107,045 tonnes of wheat is produced on 52,193 hectares, 93,059 tonnes of barley on 34,215 hectares, 23,814 tonnes of chickpea on 22,657 hectares and 6,073 tonnes of rose on 1,584 hectares in Isparta. As of the end of 2022, wheat production decreased by 5% to 101,755 tonnes, barley production increased by 7% to 99,566 tonnes, chickpea production decreased by 84% to 3,797 tonnes and rose production increased by 179% to 16,932 tonnes (Table 1).

Table 1. Development of cultivation area and production of the crops analysed in Isparta province

Years	Wheat		Barley		Chick pea		Rose oil	
	Cultivated Area (ha)	Production (tonnes)	Cultivated Area (ha)	Production (tonnes)	Cultivated Area (ha)	Production (tonnes)	Cultivated Area (ha)	Production (tonnes)
2003	52,193	107,045	34,215	93,059	22,657	23,814	1,584	6,073
2004	48,529	113,274	38,121	107,714	26,397	32,241	1,591	7,539
2005	46,108	113,309	39,998	120,988	23,510	25,976	1,894	9,971
2006	38,951	97,109	39,393	116,258	22,566	24,396	1,903	10,056
2007	39,669	66,862	41,608	76,185	18,968	12,335	1,905	7,085
2008	39,298	94,805	36,210	107,247	19,545	18,833	1,955	8,420
2009	42,321	101,392	41,938	104,279	20,249	21,327	1,850	8,510
2010	44,166	95,706	44,228	106,324	19,531	16,098	1,850	7,863
2011	46,705	96,587	44,218	113,567	18,846	19,339	1,955	8,895
2012	46,197	96,388	41,240	103,273	14,672	16,570	2,235	7,935
2013	46,199	106,073	41,204	112,681	16,431	17,315	2,017	8,481
2014	51,828	96,030	46,779	114,809	15,920	16,972	2,049	8,382
2015	50,291	110,627	47,908	114,526	16,233	18,078	2,055	7,251
2016	49,624	105,577	46,263	101,260	15,175	17,346	2,300	10,022
2017	47,014	96,696	40,519	98,875	13,441	14,048	2,616	10,900
2018	46,224	90,149	41,470	91,786	12,692	12,567	2,744	12,332
2019	42,898	79,885	42,117	86,474	6,378	6,461	3,146	14,097
2020	47,927	92,894	41,250	84,237	5,072	4,951	3,318	15,343
2021	44,758	62,282	43,787	52,343	5,204	5,361	3,317	15,259
2022	41,522	101,755	40,236	99,566	3,266	3,797	3,427	16,932
Index (2003=100)								
2003	100	100	100	100	100	100	100	100
2004	93	106	111	116	117	135	100	124
2005	88	106	117	130	104	109	120	164
2006	75	91	115	125	100	102	120	166
2007	76	62	122	82	84	52	120	117
2008	75	89	106	115	86	79	123	139
2009	81	95	123	112	89	90	117	140
2010	85	89	129	114	86	68	117	129
2011	89	90	129	122	83	81	123	146
2012	89	90	121	111	65	70	141	131
2013	89	99	120	121	73	73	127	140
2014	99	90	137	123	70	71	129	138
2015	96	103	140	123	72	76	130	119
2016	95	99	135	109	67	73	145	165
2017	90	90	118	106	59	59	165	179
2018	89	84	121	99	56	53	173	203
2019	82	75	123	93	28	27	199	232
2020	92	87	121	91	22	21	209	253
2021	86	58	128	56	23	23	209	251
2022	80	95	118	107	14	16	216	279

Source: TURKSTAT, 2023.

In this study, it was aimed to examine the changes in the cost and profitability of rose (oil), barley, wheat and chickpea, which are important agricultural products in Isparta province.

MATERIALS AND METHODS

The main material of the research is the statistical data of Isparta Provincial Directorate of Agriculture and Forestry. The data used in the important agricultural product costs of the province cover the period 2015-2022. In addition, TURKSTAT and FAO statistical data were also utilized. In the study, absolute profit, relative profit and gross profit indicators were calculated. Absolute profit is the difference between income and expenses. The main purpose of the business is to make profit and to seek ways to maximize this profit. The difference between gross production value (GPV) and production cost is called absolute profit or net profit [2]. Relative profit is the ratio of gross value of production to the cost of production. It shows proportionally how superior one option is to the other. This profit better measures the return of production activities [35].

In the products subject to the research, the proportional shares of the cost elements in total costs were calculated and their weights in total costs were determined. In addition, product production cost and profitability and their changes over the years were analyzed by simple index. Cost and profitability values were converted into real values using the Producer Price Index (PPI; 2003=100) calculated by TURKSTAT.

RESULTS AND DISCUSSIONS

Wheat

Taking 2015 as the base year for wheat costs for Isparta province, there was a significant increase in harvesting, marketing and land rent in wheat production (Table 2). Especially in recent years, with the effect of Covid-19 and the Ukraine-Russia war, there has been a serious increase in input costs and accordingly, there has been a serious increase

in costs. The foreign dependence on inputs used in agricultural production in Türkiye is also one of the important factors that increase costs. It can be said that the reason why the sowing costs were lower in the periods considered compared to 2015 was that the majority of the producers preferred the seed they separated from their own production due to the high prices of certified seed. In this context, [12] determined that 48% of the producers used their own seed in their study on the use of wheat seed in agricultural enterprises.

Table 2. Change in wheat production costs in real prices per hectare (2015=100)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	100	100	85	68	68	137	102	98
Sowing	100	93	50	42	47	63	51	48
Fertilisation	100	96	69	56	73	66	73	70
Agrochemical	100	96	80	104	77	99	84	81
Harvest	100	96	99	86	73	198	163	156
Marketing	100	77	119	219	106	134	126	121
Revolving fund interest	100	95	72	67	64	102	85	81
Variable costs	100	95	72	67	64	102	85	81
General administrative expenses	100	95	72	67	64	102	85	81
Provision for land rent	100	96	88	72	78	82	115	110
Fixed costs	100	96	86	71	76	85	110	105
Production costs	100	95	74	67	66	99	89	85

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

When the shares of detailed cost elements covering the years 2015-2022 in total production costs of wheat production in Isparta province were analyzed; 23.77% of total wheat production costs were fixed costs and 76.23% were variable costs. The largest item of fixed costs was land rent provision with a proportional share of 18.11 percent in total production costs.

Table 3. The share of the items of wheat production cost (%)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	21.18	22.26	24.07	21.42	21.82	29.24	24.27	24.27
Sowing	27.76	27.00	18.58	17.32	19.64	17.55	15.76	15.76
Fertilisation	14.12	14.21	13.08	11.80	15.67	9.36	11.59	11.59
Agrochemical	5.18	5.21	5.55	7.97	6.05	5.15	4.89	4.89
Harvest	8.24	8.29	10.99	10.48	9.12	16.38	15.03	15.03
Marketing	2.94	2.37	4.71	9.57	4.76	3.98	4.17	4.17
Revolving fund interest	3.97	3.97	3.85	3.93	3.85	4.08	3.79	3.79
Variable costs	83.38	83.30	80.83	82.49	80.91	85.73	79.50	79.50
General administrative expenses	2.50	2.50	2.42	2.47	2.43	2.57	2.39	2.39
Provision for land rent	14.12	14.21	16.75	15.04	16.66	11.70	18.11	18.11
Fixed costs	16.62	16.71	19.17	17.51	19.09	14.27	20.50	20.50
Production costs	100.0	100.00	0	0	0	0	0	0

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

Among the variable cost items, the largest items are ploughing, sowing and harvesting costs. The proportional shares of these items in production costs were calculated as 24.27%, 15.76% and 15.03%, respectively (Table 3). While wheat production costs per hectare was 4,403.41 TRY in 2003 (in 2021 real prices), it increased approximately 2.5 times to 10,940 TRY in 2022. The highest value in the 2003-2022 period analyzed was reached in 2012 with 16,131.15 TRY per hectare. There is a direct and statistically significant correlation between wheat production cost and yield (Fig. 1).



Fig. 1. The evolution of the production cost and yield of wheat production per hectare
Source: Own calculation.

The relative profit in wheat production was calculated as 3.00 in 2003 and 1.51 in 2022. Relative profit showed a decreasing trend from 2003 to 2009. After this year, it showed an increasing trend until 2015, while it was at the level of 1.50 in 2016-2020, it decreased to 0.91 in 2021 and reached 1.51 in 2022. In 2007, 2008, 2009 and 2021, wheat producers suffered losses from this production (Fig. 2).

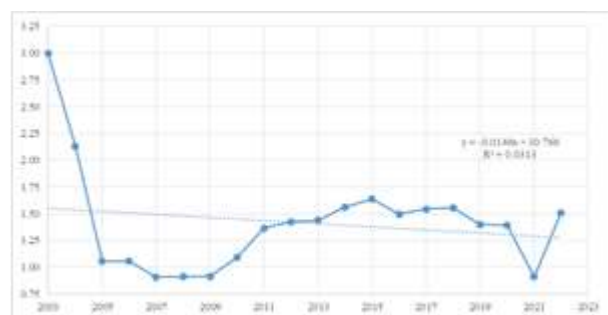


Fig. 2. The evolution of the relative profitability of wheat production
Source: Own calculation.

Wheat yield per hectare in Isparta province varied according to years. The main reason

for this variability is climatic factors. In this context, the production cost of 1 kg of wheat produced in 2021 was the highest with 8.75 TRY. In the years examined, the cost of 1 kg of wheat had the second highest value in 2012 with 7.68 TRY, the third highest value in 2008 with 6.26 TRY and the fourth highest value in 2022 with 6.11 TRY. In 2003 and 2004, it was determined that the lowest kg wheat production costs were 2.15 TRY and 2.23 TRY. The years when the cost of 1 kg wheat was below 5 TRY were 2003, 2004, 2005, 2006, 2011, 2014, 2015, 2016, 2017, 2018 and 2019. There is a direct and statistically significant correlation between kg production cost of wheat and kg sales price. In 2007, 2008, 2009, 2021, costs were above the selling price (Fig. 3).

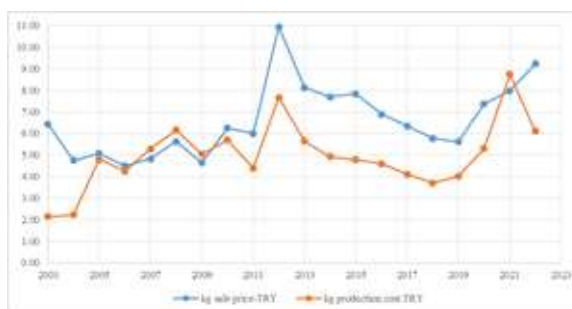


Fig. 3. The evolution of the real sale price and cost per kg of wheat production
Source: Own calculation.

Barley

When we analyzed the changes in barley production costs, which we calculated by converting to real prices between 2015 and 2022, based on 2015, it was found that the cost items with the highest increases were harvesting (58%), ploughing (10%) and land rent provision (10%). In the same period, the highest decrease in production cost items was in the cost elements of agricultural control (41%), planting (37%) and fertilization (34%). The reason for the decrease in cost items, especially in fertilizer and pesticides, can be said to be the producers' decision to reduce the use of fertilizers and pesticides due to increasing input prices. In addition, the reason for the decrease in the cost of sowing can be said to be the tendency to use their own seeds instead of using certified seeds from outside.

Table 4. Change in barley production costs in real prices per hectare (2015=100)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	100	101	93	73	76	154	115	110
Sowing	100	98	77	71	97	88	66	63
Fertilisation	100	84	26	53	52	77	69	66
Agrochemical	100	89	81	99	96	78	62	59
Harvest	100	110	99	86	73	198	165	158
Marketing	100	96	110	87	99	92	73	70
Revolving fund interest	100	81	64	62	68	96	76	73
Variable costs	100	95	75	73	79	113	89	85
General administrative expenses	100	95	75	73	79	113	89	85
Provision for land rent	100	112	102	87	83	99	115	110
Fixed costs	100	109	98	85	83	101	111	106
Production costs	100	98	79	75	80	111	93	89

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

In barley production in 2022, the share of variable costs in production costs per hectare was 79.48% and the share of fixed costs was 20.52%. Among the production costs, ploughing had the highest share with 24.30% and general administrative expenses had the lowest share with 2.38%. The share of ploughing cost element in total barley production costs varied between 19.27% and 24.30% in the years analyzed. The share of sowing cost element varied between 15.41% and 26.21%. The share of land rent cost element varied between 13.13 per cent and 18.96 per cent. The share of harvesting cost element varied between 7.83% and 15.23% (Table 5).

Table 5. Barley production costs (%)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	19.63	20.21	23.06	19.27	18.72	27.36	24.30	24.30
Sowing	21.60	21.66	21.01	20.56	26.21	17.07	15.41	15.41
Fertilisation	15.71	13.48	5.13	11.09	10.21	10.94	11.69	11.69
Agrochemical	7.12	6.50	7.28	9.42	8.51	5.03	4.71	4.71
Harvest	8.59	9.63	10.76	9.85	7.83	15.32	15.23	15.23
Marketing	5.52	5.41	7.69	6.42	6.81	4.60	4.35	4.35
Revolving fund interest	4.62	3.85	3.75	3.83	3.91	4.02	3.78	3.78
Variable costs	82.79	80.73	78.67	80.46	82.21	84.34	79.48	79.48
General administrative expenses	2.48	2.42	2.36	2.42	2.47	2.53	2.38	2.38
Provision for land rent	14.73	16.85	18.96	17.13	15.32	13.13	18.13	18.13
Fixed costs	17.21	19.27	21.33	19.55	17.79	15.66	20.52	20.52
Production costs	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

Barley production costs per hectare, which we calculated with real prices between 2003 and 2022, had the lowest value in 2003-2004. The year with the highest cost was 2012. In the same period, barley yield per hectare was the highest in 2010 with 3,200 kg and the lowest in 2021 with 1,195 kg. It can be said that climatic factors are the most important reasons for the variability of barley yield over the years. Especially the lack of periodic precipitation significantly reduced the yield. There was a positive correlation between chickpea production cost per hectare and yield values. However, this relationship was not statistically significant (Fig. 4).

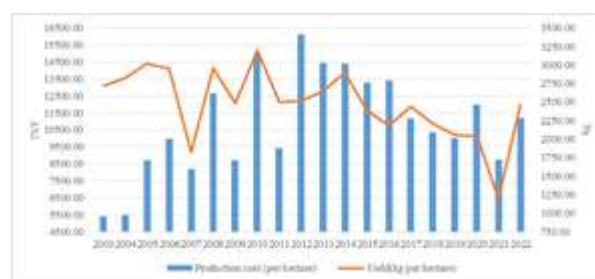


Fig. 4. The evolution of the production cost and yield of barley production

Source: Own calculation.

Relative profit in barley production reached its highest value of 2.38 in 2004 and its lowest value of 0.86 in 2021. Relative profit showed a decreasing trend between 2004-2007 and 2017-2021. It was determined that there was a constant trend between 2013-2016. In 2007 and 2021, barley producers suffered losses from this production (Fig. 5).

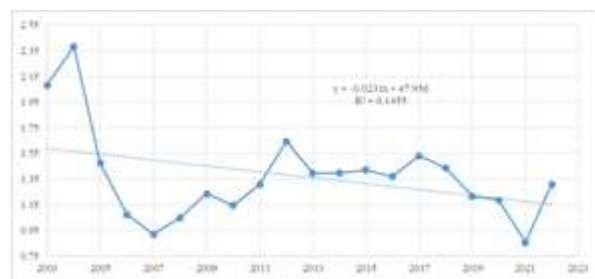


Fig. 5. The evolution of the relative profitability of barley production

Source: Own calculation.

When the barley production cost per kilogram and the barley selling price per kg, which we determined as a result of our calculations with real prices for barley production, were

analyzed; kg barley production cost was the highest in 2021 with 7.32 TRY. In 2004 and 2003, the barley production cost per kg was the lowest (1.93 TRY and 1.98 TRY, respectively). The selling price per kg was below the cost of barley production in 2007 and 2021, and therefore barley producers suffered losses in these years. In general, there was an increasing trend in the selling price per kg and the cost of production per kg of barley. The highest barley selling price per kg was 10.53 TRY in 2012. There were fluctuations in barley sales price per kg and production cost. It can be said that these fluctuations were caused by agricultural frost events and low rainfall due to climatic factors in Isparta province. We found a positive correlation between the farmers' barley selling price per kg and barley production cost per kg calculated in real prices. This relationship was statistically significant (Fig. 6).

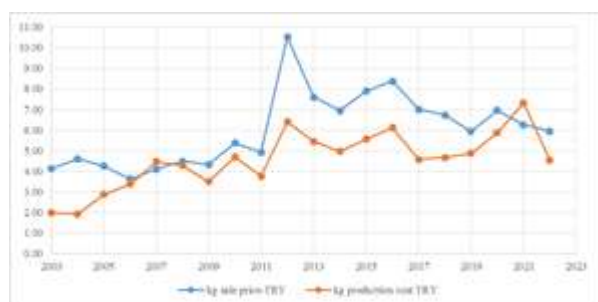


Fig. 6. The evolution of the real sale price and cost per kg of barley production
 Source: Own calculation.

Chickpea

When the changes in real prices of cost elements of chickpea production in Isparta province in the period covering the years 2015-2022 were analyzed; it was found that total production costs decreased by 22% compared to 2015. The cost elements of chickpea production also decreased by 47% and 13% compared to the base year. Only the cost element of land rent provision increased by 10 per cent. It can be said that the reason for the decrease in production costs is that producers have reduced the amount of input use due to the increase in input prices in recent years (Table 6). As a matter of fact, [10] reported in their study conducted in

Kütahya province that chickpea producers used less inputs in chickpea farming.

Table 6. Change in chickpea production costs at real prices per hectare (2015=100)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	100	100	89	71	64	62	58	65
Sowing	100	101	98	81	73	98	70	87
Fertilisation	100	105	96	67	59	57	60	53
Agrochemical	100	104	109	109	89	89	65	78
Harvest	100	110	99	86	79	79	59	76
Marketing	100	111	103	98	99	101	73	100
Revolving fund interest	100	103	97	82	73	78	63	73
Variable costs	100	103	97	82	73	78	63	73
General administrative expenses	100	103	97	82	73	78	63	73
Provision for land rent	100	112	102	87	83	102	80	110
Fixed costs	100	111	101	86	82	98	78	105
Production costs	100	105	98	82	74	81	66	78

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

For the year 2022, 22.38% of production costs consist of fixed costs and 77.62% of variable costs. The biggest cost items among the variable cost items are sowing (20.05%), ploughing (16.86%), pest control (11.85%) and fertilizer cost (10.30%). In the years analyzed, the land rent provision accounted for 14.26% and 20.05% of the total production costs. The share of sowing in total production costs was 17.42% and 21.72% (Table 7).

Table 7. Chickpea production costs (%)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	20.44	19.59	18.48	17.67	17.74	15.64	18.13	16.86
Sowing	18.07	17.42	18.07	17.67	17.74	21.72	19.13	20.05
Fertilisation	15.21	15.24	14.86	12.40	12.06	10.71	13.91	10.30
Agrochemical	11.89	11.76	13.25	15.79	14.19	13.03	11.80	11.85
Harvest	8.32	8.71	8.43	8.65	8.87	8.11	7.45	8.02
Marketing	5.35	5.66	5.62	6.39	7.10	6.66	5.96	6.84
Revolving fund interest	3.96	3.92	3.94	3.93	3.89	3.79	3.82	3.70
Variable costs	83.24	82.29	82.66	82.49	81.59	79.66	80.21	77.62
General administrative expenses	2.50	2.47	2.48	2.47	2.45	2.39	2.41	2.33
Provision for land rent	14.26	15.24	14.86	15.04	15.97	17.95	17.39	20.05
Fixed costs	16.76	17.71	17.34	17.51	18.41	20.34	19.79	22.38
Production costs	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	0	0	0	0	0	0	0	0

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

It was determined that chickpea production costs per hectare between 2013-2022 showed significant variability between years. The main reason for this variability is that chickpea agriculture is directly affected by climatic factors. In this context, the cost of chickpea per hectare was the highest in 2010 with 24,904.45 TRY. It was found to be the lowest in 2021 with 10,761.11 TRY. Chickpea yield was the highest in 2010 with 1

300 kg and the lowest in 2021 with 420 kg. Production costs remained below 10,000 TRY per hectare between 2004 and 2006, while it was in an increasing trend between 2007 and 2010, it decreased in 2011, it was above 15,000 TRY between 2012-2019 and remained below 13,000 TRY in 2021 and onwards. There was a positive correlation between farmers' chickpea production costs per hectare and their yields in real prices, which was statistically significant (Fig. 7).

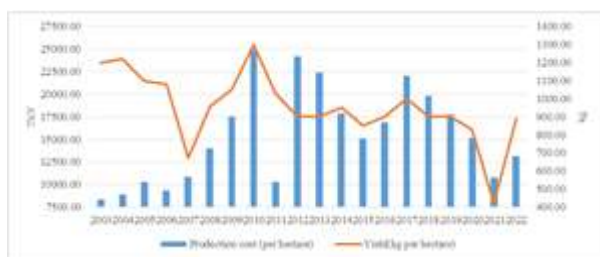


Fig. 7. The evolution of the production cost and yield of chickpea production
Source: Own calculation.

The relative profit in chickpea production was the highest in 2003 with a rate of 2.62. In 2020, which was also the year of the pandemic, it took its lowest value with a rate of 0.77. Producers made losses in 2009, 2020 and 2021. The years with the best profit margins were 2003, 2004, 2005, 2006, 2006, 2011, 2014, 2015, 2016, 2017 and 2018. In these years, profit margins were above 60% (Fig. 8).

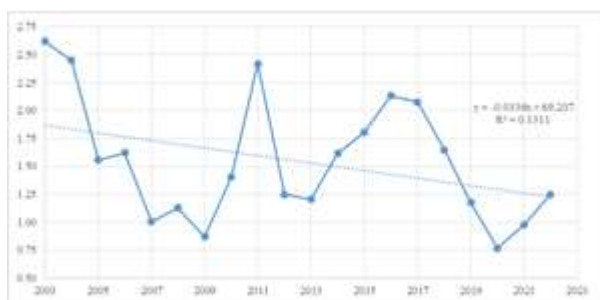


Fig. 8. The evolution of the relative profitability of chickpea production
Source: Own calculation.

In 2003, the real selling price of chickpea was 18.17 TRY per kilogram, while the production cost was 6.94 TRY. In 2022, the selling price per kilogram increased to 18.47 TRY and the production cost increased to 14.78 TRY. In 2007, 2009, 2020 and 2021,

the selling price per kg was below the production cost per kg. Therefore, producers suffered losses in these years. The selling price per kg chickpea of farmers was in an increasing trend until 2018. After this year, it decreased and took its lowest value during the pandemic (2020). Farmers' production cost per kg of chickpea had an increasing trend (except for 2011 and 2022). In real prices, there is a positive correlation between farmers' kg chickpea selling price and kg production cost values, which is statistically significant (Fig. 9).

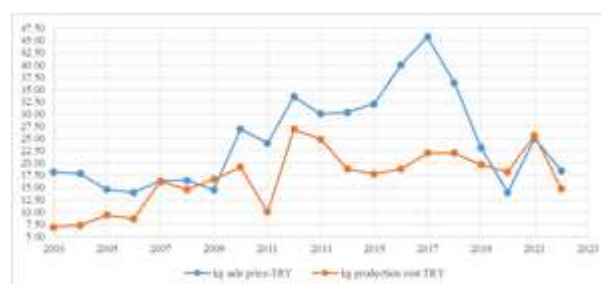


Fig. 9. The evolution of the real sale price and cost per kg of chickpea production
Source: Own calculation.

Oil Rose

When the real prices of oil rose costs and the changes between 2015 and 2022 are analysed, it was found that the production cost items with the highest increase were pest control, fertilization and harvesting when 2015 was taken as reference.

Table 8. Change in production costs of oil rose in real prices per hectare (2015=100)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	100	107	92	80	68	64	53	51
Channel-digging	100	84	103	98	83	78	65	62
Pruning	100	110	114	119	127	119	99	95
Fertilisation	100	107	100	137	152	143	119	114
Agrochemical	100	121	148	165	153	144	120	115
Hoe-drilling	100	102	99	78	70	66	55	53
Harvest	100	104	110	109	148	139	116	111
Marketing	100	105	137	124	114	107	90	86
Revolving fund interest	100	106	114	117	126	119	99	95
Variable costs	100	106	114	117	126	119	99	95
General administrative expenses	100	106	114	117	126	119	99	95
Interest on land capital	100	120	124	114	100	94	78	75
Depreciation of fixed plant	100	105	116	99	87	81	68	65
Fixed facility interest	100	105	116	99	90	84	70	67
Fixed costs	100	107	117	102	90	85	71	68
Production costs	100	107	115	109	107	101	84	81

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022

It can be said that the reason why ploughing and trenching costs were low in the period under consideration was due to the fact that the producers restricted the use of mechanization in soil tillage in order to be less affected by the increasing fuel costs in recent years.

Considering the year 2022, it was calculated that while variable costs were 55.79% of production costs, fixed costs were 44.21%. The highest share in production cost items is depreciation of fixed plant with 23.55%, harvesting with 18.09%, fixed plant interest with 12.21%, fertilization with 10.32% and pest control with 9.91%. The share of harvesting costs varied between 12.56% and 18.09% over the years. The share of fertilization showed an increasing trend between 6.33% and 10.32%. The share of depreciation of fixed plant showed a decreasing trend between 23.55% and 29.30%. The share of fixed plant interest showed a decreasing trend between 12.21% and 14.59% (Table 9).

Table 9. Rose (oil) production costs (%)

Cost Elements	2015	2016	2017	2018	2019	2020	2021	2022
Soil cultivation	3.28	3.27	2.62	2.40	2.07	2.07	2.07	2.07
Channel-digging	2.92	2.29	2.62	2.61	2.26	2.26	2.26	2.26
Pruning	2.55	2.62	2.51	2.79	3.01	3.01	3.01	3.01
Fertilisation	7.30	7.33	6.33	9.15	10.32	10.32	10.32	10.32
Agrochemical	6.93	7.85	8.89	10.46	9.91	9.91	9.91	9.91
Hoe-drilling	5.47	5.24	4.71	3.92	3.58	3.58	3.58	3.58
Harvest	13.13	12.76	12.56	13.07	18.09	18.09	18.09	18.09
Marketing	3.65	3.60	4.34	4.14	3.88	3.88	3.88	3.88
Revolving fund interest	2.26	2.25	2.23	2.43	2.66	2.66	2.66	2.66
Variable costs	47.50	47.21	46.80	50.97	55.79	55.79	55.79	55.79
General administrative expenses	1.42	1.42	1.40	1.53	1.67	1.67	1.67	1.67
Interest on land capital	7.30	8.18	7.85	7.63	6.78	6.78	6.78	6.78
Depreciation of fixed plant	29.19	28.80	29.30	26.58	23.55	23.55	23.55	23.55
Fixed facility interest	14.59	14.40	14.65	13.29	12.21	12.21	12.21	12.21
Fixed costs	52.50	52.79	53.20	49.03	44.21	44.21	44.21	44.21
Production costs	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
costs	0	0	0	0	0	0	0	0

Source: Own calculation on the basis of data from Isparta Provincial Directorate of Agriculture and Forestry data base 2015-2022.

Although there was a negative correlation between production cost per hectare and yield per hectare of oil rose in real prices, there was no statistical relationship. The production cost had its highest value in 2009 with 106,954.93 TRY and its lowest value was in 2003 with 35,289.50 TRY. Rose yield per hectare followed a fluctuating course due to climatic factors. Rose yield per hectare was highest in 2006 with 5,553 kg and lowest in 2015 with 3,527 kg (Fig. 10).

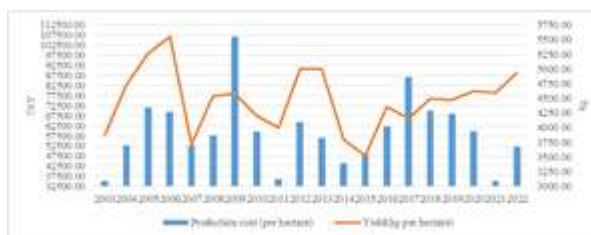


Fig. 10. The evolution of the production cost and yield of oil rose production

Source: Own calculation.

The relative profit in oil rose production was 3.64 in 2003. It decreased 2.30 times over time and was found to have decreased to 1.58 in 2022. Relative profit showed a decreasing trend between 2003 and 2009. From 2009 to 2016, it was in an increasing trend. After 2016, it was determined that there was a decreasing slope until 2022. In the periods analysed, relative profit reached its highest value in 2003 with a ratio of 3.64 and its lowest value in 2009 with a ratio of 0.71. It can be said that farmers producing oil roses generally made a profit in all years except 2009 (Fig. 11).

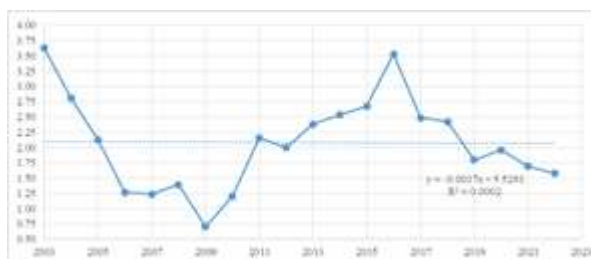


Fig. 11. The evolution of the relative profitability of oil rose production

Source: Own calculation.

When the real selling price per kg and the cost of oil rose production were analysed between 2003 and 2022, there was a relationship between the two variables in the same direction but not statistically significant. There was a fluctuation in the rose yield due to agricultural frosts in Isparta province in some years during the periods considered. This fluctuation in the yield of oil rose affected the unit cost per kg and the selling price of rose. In real prices, the cost of oil rose had the lowest value in 2021 with 7.69 TRY per kg and the highest value in 2017 with 20.81 TRY. It was determined that in the year when the production cost of oil rose was the

highest, the sales price was also high. In 2009, since the sales price was below the production cost, the producers suffered losses. The years 2015-2018 were the years in which farmers' sales prices of oil rose were historically the highest (Fig. 12).

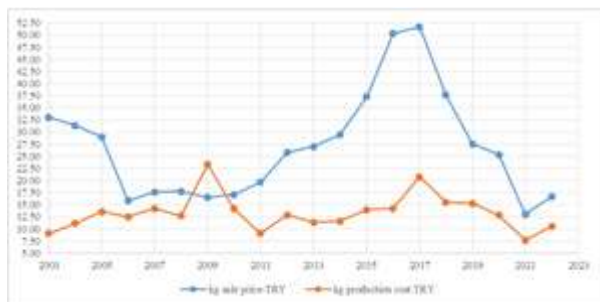


Fig. 12. The evolution of the real sale price and cost per kg of oil rose production

Source: Own calculation.

CONCLUSIONS

In this study, the changes in the cost and profitability of rose (oil), barley, wheat and chickpea, which are important agricultural products in Isparta province, were analyzed.

Statistical records of Isparta Provincial Directorate of Agriculture and Forestry were used as the main material of the research, together with the data obtained from TURKSTAT and FAO and relevant national and international research findings.

Cost items for rose (oil), barley, wheat and chickpea production, their proportional shares in total cost and profit were analyzed by years. Cost and profitability indicators were expressed in real values. Changes in profit and cost items over the years were analyzed and the main reasons for the changes were determined accordingly.

Considering the periods analyzed; there was a general upward trend in production costs. Diesel, fertilizer, agricultural expenses and harvest labor expenses, which are important inputs, cause the cost to increase. This reduces the profit margin of producers. In order to reduce the costs of the producers; Since the supports provided by the Ministry cannot reach the mass of producers sufficiently, there is not enough decrease in costs.

Especially in recent years, due to the developments in the supply chain after Covid-

19, there has been an increase in costs due to input and supply problems. Türkiye's dependence on foreign inputs used in agricultural production can also be said to be one of the important factors that increase costs.

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