Economic analysis of cotton production in Türkiye

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Yeşim Aytop
Assoc. Prof. in Agricultural Economics
Institution: Kahramanaras Sutcu Imam University
Address: Faculty of Agriculture, Department of Agricultural Economics, P.O. Box: 46050. Onikişubat, Kahramanmaras, Türkiye
Corresponding author E-mail: **yesimmeral@ksu.edu.tr**

Semiha Çetinkaya
Res. Assist. in Agricultural Economics
Institution: Kahramanaras Sutcu Imam University
Address: Faculty of Agriculture, Department of Agricultural Economics, P.O. Box: 46050. Onikişubat, Kahramanmaras, Türkiye
E-mail: **semihacetinkaya@ksu.edu.tr**

Abstract

Türkiye, which ranks 7th in the world cotton production, is unable to meet domestic demand for cotton, with this production, although it meets 3.1% of the total cotton production. The aim of this research is to determine the physical production inputs, cost and profitability of cotton production and to reveal the importance of agricultural supports for the sustainability of cotton production. The data of the research were obtained from the questionnaires of 657 cotton producers in 5 provinces where cotton production is intensive in Türkiye. One crop budget analysis was used to analyse the data. According to the findings, producers obtained an average yield of 5124.20 kg/ha on an average area of 19.66 ha. Gross profit per hectare is 25217.2 TL. The average profit margin is 1.53 TL/kg and 1.30 TL profit is obtained for 1 TL cost in cotton production. Without agricultural subsidies, this profit decreases to 1.17 TL. When agricultural supports are not taken into account, Gross Production Value (GPV) decreases by 11.45%. This reveals the importance of agricultural supports in cotton production. Türkiye is a foreign-dependent country in cotton and a significant portion of its cotton need is met by imports. All policies to increase the cultivation area of the cotton plant, which is of strategic importance for the country, will be applicable as long as producers make profit. In this respect, production will be sustainable when the continuity of agricultural supports given to cotton is in question.

Keywords: Cotton production. Cost. Profitability. One crop budget analysis.

1. Introduction

Cotton is an agricultural product that is produced and traded worldwide and is important for national economies (Çetinkaya and Aytop, 2023). In addition to providing raw materials for the textile industry, it is also used in the livestock and oil industry (Sezgin and Bayhan, 2023). Cotton plant provides employment and added value as well as being a source

of raw material for ginning, fibre, textile, oil and paper sectors (Esgici et al. 2022). In addition, the oil obtained from cotton seeds is used as raw material in biodiesel production as an alternative to petroleum (Bolat, 2023). This increases the importance of cotton production and trade.

According to FAOSTAT data, a total of 69.7 million tonnes of cotton was produced in the world in 2022. China (18.1 million tonnes), India (15 million tonnes), USA (8.5 million tonnes) and Brazil (6.4 million tonnes) alone accounted for 68.9% of this production. Türkiye ranks 7th in terms of cotton production amount. Ranking 12th in terms of cultivation areas, Türkiye ranks 2nd in terms of yield average. Türkiye, which has an important share in cotton production, produces 4% of the world cotton. In 2022, 2.8 million tons of cotton was produced on an area of 573 thousand hectares, while in 2023, cotton cultivation area decreased by 16.7% to 477 thousand hectares and production decreased by 23.6% to 2.1 million tons (TURKSTAT, 2023). In Türkiye, 62.8 per cent of the cotton cultivation area and 61.6 per cent of the production amount are located in the Southeastern Anatolia Region. The Aegean Region and the Mediterranean Region account for 23 per cent and 14.3 per cent of cotton cultivation areas and 23.5 per cent and 14.9 per cent of cotton production, respectively.

Like other sectors, producers in the agricultural sector also suffer from economic events. Unlike other sectors, natural events can also increase the damage. Therefore, the agricultural sector needs to be protected by governments. Many governments around the world intervene in the agricultural sector to improve co-operation, increase efficiency and income, and ensure food security (Lundberg, 2005). Agricultural subsidies are one of these policy instruments. Agricultural subsidies are provided to producers in the world and in Türkiye in order to protect the agricultural sector, to encourage production and to ensure sustainability in agricultural production.

The high agricultural support budget allocated for cotton shows that cotton production is given special importance. In 2023, cotton producers were given an area-based support payment of 3660 TL for 1 ha of cotton (3450 TL diesel support, 210 TL fertiliser support) and a difference payment support of 1.60 TL for 1 kg of cotton (Official Gazzette, 2023).

Foreign dependency in cotton production in Türkiye prevents competition in international markets and continuity in production. In addition, the decrease in cotton production from year to year causes a decrease in income and causes producers to give up cotton production. It is important to calculate the cost of production in order to ensure sustainability in production and competition in international markets (Özüdoğru, 2021).

Therefore, this study aims to determine the physical production inputs used in cotton production in Türkiye, cotton production cost and profitability.

2. Literature Review

High production cost is considered to be the most important problem encountered in cotton production (Gençer et al. 2005; Yılmaz and Demircan, 2005; Demirkan and Uysal, 2011; Soviadan et al. 2019). Studies carried out to determine the cost of cotton production in Türkiye show that the GPV obtained from unit area cannot cover all production costs (Yılmaz and Demircan, 2005; Bahadır, 2006; Keskin and Ören, 2008; Candemir et al. 2012; Alemdar et al. 2014; Candemir et al. 2017, UPK, 2018; Semerci and Çelik, 2018 and Şahin, 2019), showing that profitability in cotton production can only be achieved with agricultural supports (Candemir et al. 2012; Alemdar et al. 2014; Candemir et al. 2017; Semerci and Çelik, 2018; Şahin, 2019; Aytop et al. 2022).

Among the studies on cost analysis in cotton production in the world, Tzouvelekas et al. (2001) found the total production costs and gross profit of conventional cotton farms to be $293.4/ha and $66.8/ha, respectively, and determined that 34.6% of the production costs were land rent, 20.1% labour, 14.5% depreciation costs, 8.1% fuel and 5.5% fertilisation costs, respectively. Wossink and Denaux (2006) found that the gross production value of cotton produced from herbicide tolerant seeds was 1143.33 $/ha, the gross production value of cotton produced from stacked genetics seeds was 1190.53 $/ha, and the gross production value of cotton produced from conventional seeds was 1198.90 $/ha in a study conducted in North Carolina, USA. Khan et al. (2009) found the gross income of cotton farms as 2431.2 $/ha, net income as 1258.9 $/ha, benefit cost ratio as 0.25 $/ha, total production costs as 1172.3 $/ha in their study conducted in China and determined that 273.2 $/ha of production costs consisted of land preparation and sowing operations, 261.7 $/ha of irrigation and weed removal, 256.5 $/ha of harvesting operations. Zahedi et al. (2014) found the average yield of cotton holdings as 2738.2 kg/ha, gross production value as 2359.21 $/ha, total production cost as 1927.93 $/ha, gross income as 1067.96 $/ha and the selling price of 1 kg cotton as 0.86 $ and production cost as 0.40 $. Bashimov (2018) found the production cost of 1 hectare of cotton as 544.82 $ in his study conducted with cotton producing enterprises in Turkmenistan and determined that 90.85% of production costs were variable costs and 9.15% were fixed costs. The largest share of variable costs was irrigation (34.78%), machine draw power (16.34%) and fertiliser costs (14.41%), while the largest share of fixed costs was insurance payments

(6.42%). In addition, the cost of 1 kg of cotton was found to be 0.25 $. Siamardov (2020), on the other hand, in his study conducted in Tajikistan, found the GPV in cotton production as $ 1232, net profit as $ 88.88 and gross profit as $ 664.42. Dansoko (2021), in his study conducted in Mali, found that 35.37% of variable costs in cotton production were fertiliser (average $425.96/ha), 33.09% were seed costs (average $392.21/ha), and 69.51% of fixed costs were family labour compensation (average $645.26/ha). They also determined the average GPV in cotton production as 3519.89 $, gross profit as 1177.80 $ and net profit as 1595.94 $. Dhunde et al. (2022) conducted a study in Maharashtra region of India and found that land rent (24.71%) and family labour compensation (19.72%) constituted the highest share of total cost items in organic irrigated cotton cultivation, while land rent (20.26%) and foreign labour compensation (20.38%) constituted the highest cost items in conventional irrigated cotton cultivation. Similarly, in the Punjab region of Pakistan, Wei et al. (2020) found that labour, fertilizer and chemical pesticides and Bashir et al. (2020) found that land rent, payments to workers working in fertilization and harvesting constitute the highest cost items in cotton production.

Among the studies on cost analysis in cotton production in Türkiye, Yılmaz and Demircan (2005) aimed to compare the cost of cotton production between regions in their study conducted in Şanlıurfa, Adana, Antalya, Aydın, Hatay and İzmir provinces and determined that 79.8% of the cost elements in cotton production were variable costs and 20.2% were fixed costs. They found that the largest share of variable cost items is labour (27.4), machine tractive power (17.6) and harvesting (16.4) costs, while the largest share of fixed cost items is land rent (17.9). Yılmaz and Gül (2015) determined that the highest cost items in cotton production were labour (36.18%), machinery (14.11%) and fertilisation (13.62%) in their study conducted in Antalya province. Cotton yield per decare was found to be 391.30 kg and the production cost of 1 kg cotton was determined as 2.05 TL. Candemir et al. (2017) determined the production cost of 1 kg cotton as 1.79 TL in their study in Kahramanmaraş province and revealed that 70.1% of the total costs were variable costs and 29.9% were fixed costs. While the largest expense item among variable costs is tools and machinery (33.2%) and fertiliser (10.4%), the largest share among fixed costs is land rent (27.8%). Uğurlu (2020) found the total cost of 1 decare of cotton as 1830.8 TL and the cost of 1 kg of cotton as 2.17 TL in a study conducted with cotton producers in Manisa province. He determined that 60.36% of the total costs were variable costs and 39.64% were fixed costs. While the highest share of variable costs was labour costs and machine use (27.9%), the highest share of fixed costs was land rent (32.77%).

3. Material and Method

3.1. Material

The provinces in the research area constitute 81.2% of cotton cultivation areas and 80.8% of cotton production in Türkiye. Şanlıurfa produced 881 thousand tonnes of cotton on 203 thousand hectares, Diyarbakır produced 303 thousand tonnes on 70.5 thousand hectares, Aydın produced 242 thousand tonnes on 56.5 thousand hectares, Hatay produced 185 thousand tonnes on 38.9 thousand hectares and Adana produced 85 thousand tonnes on 18.3 thousand hectares (TURKSTAT, 2023). Therefore, these five provinces, which constitute the majority of cotton cultivation area and cotton production amount, were included in the scope of the study.

The study's data were obtained from face-to-face interviews with 657 cotton producers in the research region in the year of 2021. The proportional sampling approach was used to calculate the sample size volume questionnaire (Newbold, 1995). With a 99% confidence interval and a 5% margin of error, the sample size was computed. In the provinces of Sanliurfa, Aydin, Hatay, Diyarbakir and Adana, 377; 106, 81; 48; 45 producers were interviewed, respectively. The surveys were distributed proportionally according to the number of cotton producers in the districts and a total of 657 producers were interviewed face-to-face in 5 provinces, 19 districts and 251 villages/mahallas.

$$n = \frac{Np(1-p)}{(N-1)*\sigma_{px}^2 + p(1-p)} = 657$$

In the formula, n: Sample volume, N: Population (Number of producers), $\sigma^2_{px:}$ The variance of the ratio, p: the ratio of cotton producers (p= 0.5 to reach the maximum sample size).

3.2. Method

Descriptive statistics, chi square, ANOVA test and the single product budget analysis method were used in the analysis of the data. The Single Product Budget Analysis Method developed by Kıral et al. (1999) was used to calculate the costs of agricultural enterprises. Enterprise costs and income were calculated only for cotton crop. On the other hand, the amounts of labour force and tractive power used in cotton production were given in hours, and the foreign labour wage prevailing in the research area was taken into consideration in the calculation of family labour wage. Since the calculation of the share of common expenses

(building, machinery, etc.) in cotton requires the application of cost accounting technique, alternative values valid in the research area were taken into consideration for the wages of production operations. The labour force was calculated in terms of male labour units (LU) (Açıl, 1980). The interest rate of the revolving fund was determined by taking half of the Ziraat Bank interest rate of 2020, and 3% of the total variable costs were calculated as general administrative expenses. The following formulae were used to calculate the cost per unit area, gross income, net income and relative profits in cotton production (Açıl and Demirci, 1984; Kıral et al. 1999).

Fixed costs = General administration expenses + land rent

Sum of production cost = Variable costs + Fixed costs

Gross production value = Yield * selling price + supports

Gross profit = Gross production value – Variable costs

Net profit = Gross production value – Sum of production cost

Proportional profit = Gross production value / Sum of production cost

4. Results and Discussion

The socio-demographic characteristics of the surveyed producers are given in Table 1. All of the producers consisted of males. Among the surveyed producers, 91.2% were married and 47.5% were in the age range of 35-54 years (average age: 45.28 years). 44% of the producers are primary school graduates and below, 23.1% are high school graduates, 39.7% have 5-7 individuals in their households, while 51.8% have less than two individuals working in agriculture (average number of household members: 6.28 persons, the average number of people working in agriculture in the household: 2.61 people). While 42.6% of the producers have 20-35 years of agricultural production experience, 43.5% of them have 20-25 years of cotton production experience (average agricultural experience: 26.07 years, cotton production experience average: 22.32 years). 77.9 per cent of the producers have social security and 51.3 per cent have non-agricultural income. In addition, 29.8% of the producers are members of at least one agricultural cooperative.

Table 1: Socio-demographic characteristics of producers

		Frequency	Ratio (%)	Mean
Gender	Male	657	100.0	
Marital status	Single	58	8.8	
	Married	599	91.2	
Age (years)	<35	160	24.4	45.28

	35-54	312	47.5	
	≥55	185	28.2	
Education level	≤ Primary school graduate	289	44.0	
	Secondary school graduate	126	19.2	
	High school graduate	152	23.1	
	≥University graduate	90	13.7	
Number of people in the household (person)	≤ 4	208	31.7	6.28
	5-7	261	39.7	
	≥8	188	28.6	
Number of people in agriculture in the household (person)	≤1	340	51.8	2.61
	≥2	317	48.2	
Experience of farmers (years)	<20	208	31.7	26.07
	20-35	280	42.6	
	≥36	169	25.7	
Experience in cotton production (years)	<20	262	39.9	22.32
	20-35	286	43.5	
	≥36	109	16.6	
Social security status	No	145	22.1	
	Yes	512	77.9	
Non-agricultural income	No	337	51.3	
	Yes	320	48.7	
Cooperative membership status	Non-member	461	70.2	
	Member	196	29.8	
Total		657	100.0	

The average parcel width of the producers in the research area is 3.40 pieces and they produce cotton in an average area of 19.66 ha. During the survey period, cotton yield was found to be 5124.20 kg/ha on average. The producers sold the harvested cotton at 10.67 TL per kilogram (Table 2). Tzouvelekas et al. (2001) in their study in Greece found that the average yield of organic cotton farms was 218 kg/da and the average selling price was 1.23 kg/$, while the average yield of conventional cotton farms was 300 kg/da and the average selling price was 1.20 kg/$. Gunden et al. (2011) determined the average yield in cotton farms as 3928.99 kg/ha and average plot size as 4.77 ha in their study conducted in İzmir province. Zahedi et al. (2014) found the average yield of cotton farms as 2738.2 kg/ha and sales price as 0.86 $/kg in their study in Iran. Yılmaz and Gül (2015) determined cotton yield per decare as 391.30 kg in their study with cotton producers in Antalya province. Semerci and Çelik (2019) found the average cultivation area of cotton enterprises in Hatay province as 108 da. Peker (2019) determined that 50.7% of the producers in Şanlıurfa province produced cotton on land under 51 decares and 57.3% of them obtained a yield between 500-600 kg from cotton production. Aytop et al. (2022) found that the average cotton cultivation area was 16.3 ha and the average yield was 5557.2 kg/ha in Şanlıurfa province. In the period when the study was conducted, the average yield of cotton stumped in Türkiye was found to be 517 kg/ha (TURKSTAT, 2021), which is similar to the results of the study.

Table 2: Cotton production information by provinces

	Mean	Std. Deviation
Production area (ha)	19.66	1.03
Yield (kg/ha)	5124.20	38.76
Sale price (TL/kg)	10.67	0.05
Parcel (quantity)	3.40	0.18

Table 3 was prepared to determine the cost of cotton production. In the table, the practices carried out in cotton production, the amount of labour and towing power used, the materials used and the sum of the cost items are included.

In soil preparation, the first ploughing is done in December with the help of plough and the second ploughing is done in December with the help of blasting machine. In February-March, after the soil reaches to the level of annealing, cultivator is used, and in March-April, ploughing is done with a tapan and soil preparation is completed and the land is made suitable for planting.

Cotton planting coincides with the end of March-mid-April in the Çukurova region, and the end of April-early May in the Aegean, Antalya and GAP regions. It was determined that an average of 29.2 kg of cotton seed was used per hectare in the investigated enterprises. The sowing process is carried out with the help of a seeder in March-April. Sowing costs constitute 18.58% of production costs.

Thinning, weeding and hoeing are carried out in May-June. While hoeing is done with a hoeing machine, thinning and weeding are done manually. Thinning is also included in the first weeding process. In order to produce 1 hectare of cotton in the research region, an average of 76.5 TL dilution cost (0.16%), an average of 770.1 TL hoeing cost (1.64%), an average of 1596.8 TL weeding cost (3.41%) were determined.

Fertilization in cotton production is carried out between March and May. An average of 287.2 kg N (nitrogen), 95.8 kg P (phosphorus), 3.5 kg K (potassium) fertiliser is used per hectare. In the research, it was determined that the average fertiliser cost was 3610.7 TL and this cost item constituted 7.71% of the production costs.

Spraying is carried out between May and August. In the research area, it was determined that 6.78 times of spraying and 6.33 times of irrigation were performed on average. Drip, sprinkler and drip irrigation systems are intensively used in the enterprises. In cotton production, herbicides are used for the control of narrow-leaved weeds; insecticides are used for the control of insects such as aphids, green weevils and red spiders; and plant growth regulators (PGRs) including boll openers and defoliants are used for the homogenous opening

and defoliation of maturing cotton bolls. Irrigation and spraying costs are the highest items among variable costs. Irrigation and spraying costs constitute 12.30% and 9.10% of production costs, respectively.

A in the research region, 1.43 times of machine harvesting and 0.46 times of hand picking were performed on average. Cotton harvesting starts in the last weeks of September and continues until the end of November. Of the production costs, 4.06% is machine harvesting and 2.22% is hand harvesting costs.

When the cost items of the producers in cotton production were analysed, it was concluded that the total of variable costs was 35718.0 TL/ha, the total of fixed costs was 11105.8 TL/ha and the total of production costs was 46823.8 TL/ha. While 76.28% of the production costs are variable costs, 23.72% are fixed costs. The average yield obtained from cotton production was determined as 5124.20 kg/ha. The cotton produced was sold at an average price of 10.67 TL/kg. The unit cost of the product was 9.14 TL/kg and the income obtained from the sale of the product was 60935.21 TL/ha.

In their study conducted in Şanlıurfa, Adana, Antalya, Aydın, Hatay and İzmir provinces, Yılmaz and Demircan (2005) determined that 79.8% of the cost elements in cotton production were variable costs and 20.2% were fixed costs. While labour (27.4%), machine tractive power (17.6%) and harvesting (16.4%) costs constitute the largest share among variable costs, land rent (17.9%) has the largest share among fixed cost items. Gunden et al. (2011), in their study conducted in İzmir province, determined that 35.88% of the production costs in cotton farms were labour costs and 29.16% were land rent, and found that labour use for 1 hectare of cotton production was 76.16 person/day, tractor use was 21.15 hours on average, and the amount of seed used was 41.10 kg on average. They also found irrigation cost as 140.55 $/ha, fertiliser cost as 120.65 $/ha and pesticide cost as 239.45 $/ha. Ali et al. (2012), in their study with cotton producers in Pakistan, determined that the highest cost item in total cost was land rent (28.54%) and the lowest cost item was seed (2.13%). Yılmaz and Gül (2015) found total production costs as 801.06 TL/ha in their study with cotton producers in Antalya province and determined that 36.18% of these costs were labour, 14.11% were machinery, 13.62% were fertilizer, 11.22% were pesticides and 11.58% were land rent. They found cotton yield per decare as 391.30 kg and the cost of 1 kg cotton as 2.05 TL. Candemir et al. (2017) determined the production cost of 1 kg cotton as 1.79 TL in their study in Kahramanmaraş province. The cost of cotton production per decare was found to be 856.64 TL and 70.1% of these costs were variable costs and 29.9% were fixed costs. The biggest cost items within the production costs are tools and machinery (33.2%), land rent (27.8%) and

fertiliser (10.4%). Bashimov (2018) found the cost of cotton production as 544.82 $/ha in his study with cotton producing enterprises in Turkmenistan and determined that 90.85% of these costs were variable costs (494.97 $/ha), 9.15% were fixed costs (49.85 $/ha) and the production cost of 1 kg of cotton was 0.25 $. Siamardov (2020), in his study conducted in Vakhsh province of Tajikistan, determined that total production costs were 1320.88 $, of which 42.97% were variable costs (567.58 $) and 57.03% were fixed costs (753.30 $). In his study conducted in Şanlıurfa province, Darı (2020) found cotton yield as 499.5 kg/ha, GPV as 1823.1 TL/ha, gross profit as 593.7 TL/ha, net profit as 519.9 TL/ha, relative profit as 1.39, sales price of 1 kg cotton as 2.85 TL and production cost as 2.60 TL. Aytop et al. (2022) found the average yield of 1 hectare of cotton as 5357.2 kg, gross production value as 4086.27 $/ha and gross profit as 1697.28 $ in their study in Şanlıurfa province. In addition, they determined the production cost of 1 kg cotton as 0.61 $ and the average selling price as 0.76.

Table 3: Cotton physical production inputs, production costs and profitability (TL/ha)

	Human labor		Used Tractive Force		Equipment Used	Material Used			Total costs	%
	Hour	Amount	Hour	Amount		Type	Quantity	Amount		
I. version	2.4	52.9	2.4	271.7	Plow				324.6	0.69
II. version	1.4	28.0	1.4	130.6	Subsoiler				158.6	0.34
III. version	0.8	18.1	0.8	90.9	Rototiller				109.0	0.23
Cultivator	1.5	32.6	1.5	116.8	Cultivator				149.4	0.32
Scraper	1.4	31.2	1.4	92.6	Scraper				123.8	0.26
Planting	1.2	26.8	1.2	133.2	Seeder	Seed	29.2 kg	292.4	8698.1	3.58
Dilution	6.7	76.5			By hand				76.5	0.16
Hoeing	6.2	23.0	6.2	647.1	Hoeing machine				770.1	1.64
Weed removal	134.5	96.8			By hand				1596.8	3.41
Fertilization	2.6	47.0	2.6	271.1	Fertilizer spreading machine	Nitrogen	37.2 kg	292.6	3610.7	7.71
						Phosphorus	95.8 kg			
						Potassium	3.5 kg			
Spraying	3.4	66.5	3.4	448.8	Spraying machine	Herbicides, Insecticides, Plant growth regulators	8 times	747.0	4262.3	9.10
Irrigation	50.8	66.7	50.8	520.6	Flood irrigation / Drip / Sprinkler		3 times	171.0	5758.3	2.30
Electricity	41.6	73.2						2494.9	3368.1	7.19

Harvest										
Machine harvest	2.6	59.4	2.6	341.1	Cotton picker		3 times		1900.5	4.06
Hand harvesting	61.0	38.5			By hand		6 times		1038.5	2.22
Transport	9.0	96.9	9.0	777.6	Truck				974.5	2.08
Revolving capital interest rate (%8.5)									2798.2	5.98
Variable costs									**5718.0**	**6.28**
General Administrative Expenses (%3)									1071.5	2.29
Land Rent (TL/ha)									0034.3	1.43
Fixed costs									**1105.8**	**3.72**
Production costs									**6823.8**	**00.00**
By-product revenue									-	
Yield (kg/ha)							124.20		124.20	
Sale Price (TL/kg)							10.67		10.67	
Agricultural Supports (TL/ha)									6260	
Differential payment support (premium)									5500	
Input support (diesel fuel and fertilizer)									760	
Unit cost (kg/TL)									**9.14**	
Gross production value (TL/ha)									**0935.21**	

The profitability of cotton production in the analysed enterprises is shown in Table 4. The average cotton yield was 5124.20 kg/ha, the average selling price was 10.67 TL/kg and the production cost was 9.14 TL/kg. In the study, the profit margin per kilogram is 1.53 TL. The gross profit per hectare is 25217.2 TL and the share of gross profit in GPV is 41.38%. In the analysed cotton farms, net profit per hectare is 14111.4 TL and the share of net profit in GPV is 23.16%. In the study, when the agricultural supports given for cotton production were

taken into consideration, GPV was calculated as 60935.2 TL and when agricultural supports were not taken into consideration, GPV was calculated as 54675.2 TL/ha. The proportional profit in cotton production is 1.17. In cotton production, a profit of 1.17 TL was obtained for an expense of 1 TL. Considering agricultural supports, the proportional profit in cotton production was determined as 1.30. Based on agricultural supports, the profit obtained in cotton production is 1.30 TL in return for 1 TL expenditure incurred in cotton production. In addition, when agricultural supports are not taken into account, GPV decreases by 11.45%. This indicates the importance of agricultural supports in cotton production.

Semerci and Çelik (2019) and Candemir et al. (2017) stated that agricultural supports have significant effects on producer income, Aytop et al. (2022) stated that if agricultural support is not provided, no profit can be obtained from cotton production and producers will suffer losses. Yılmaz and Gül (2015) stated that premium payment is important for cotton production sustainability. Yang et al. (2022), in a study conducted in Xinjiang province of China, determined that the increase in cotton production and agricultural supports positively affected cotton yield. Similarly, Khalili (2023) determined that the premium support given to cotton producers in Türkiye positively affected cotton production.

Table 4: Profitability of cotton production in the research area

Cotton production profitability (Including agricultural subsidies)	**Overall mean**	**Cotton production profitability (Not including agricultural subsidies)**	**Overall mean**
Yield (kg/ha)	5124.20	Yield (kg/ha)	5124.20
Sale Price (TL/kg)	10.67	Sale Price (TL/kg)	10.67
Gross Production Value (TL/ha)	60935.2	Gross Production Value (TL/ha)	54675.2
Variable costs (TL/ha)	35718.0	Variable costs (TL/ha)	35718.0
Production costs (TL/ha)	46823.8	Production costs (TL/ha)	46823.8
Unit cost (kg/TL)	9.14	Unit cost (kg/TL)	9.14
Gross profit (TL/ha)	25217.2	Gross profit (TL/ha)	18957.2
Net profit (TL/ha)	14111.4	Net profit (TL/ha)	7851.4
Profit margin (TL/kg)	1.53	Profit margin (TL/kg)	1.53
Proportional profit	1.30	Proportional profit	1.17

5. Conclusion and Recommendations

In cotton production, fuel is used quite a lot due to processes such as soil preparation, spraying and fertilisation. In addition to increasing fuel prices, the increase in fertiliser and pesticide prices also increases production costs. Since the profit obtained cannot meet the production costs, producers give up cotton production and turn to alternative products. This situation is especially visible in Adana province. In the last few years, producers have transformed their cotton production areas into citrus gardens. In addition, the amount of input

support given to producers is quite insufficient in the face of increasing prices. It is important for the continuity of production that the input support given to the producers is regulated taking into account the price increases.

With the development of technology, manual harvesting has been replaced by machine harvesting. However, manual harvesting continues to be done in regions where the land is rugged and not suitable for machine harvesting. In some regions, if the cotton price is realised above the expectations of the producer, hand harvesting is carried out in order to collect the cotton remaining in the field after the machine harvest. However, manual harvesting is a process that requires a lot of labour and time and also affects yield and quality. Directing the producers to machine harvesting will contribute to saving time and increasing quality.

Although Türkiye ranks first in world cotton production, it is a country dependent on foreign cotton production. The most important problem affecting cotton production in Türkiye in recent years is the increase in production costs. In the face of these increases, producers cannot obtain the expected profit and tend to plant alternative crops in the next production period. It is important to provide producers with seed varieties suitable for the climate and soil conditions of the region where they grow cotton, and to inform producers about production processes such as soil preparation, planting, irrigation, spraying, fertilisation and harvesting. Thus, it is possible to prevent soil structure deterioration, protect the environment, ensure optimum use of resources and prevent yield losses.

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