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Evaluation of cotton production in Şanlıurfa province in terms of harvesting methods and economic costs

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Abstract

The present study was conducted to analyze the economic revenues/costs for 2020/2021 period in Şanlıurfa, where cotton production is intense. The main source of this study was the data obtained from 15 cotton farmers in the area. It was determined in the study that the cotton yield per decare varied between 450 kg and 660 kg, and the average yield was 562 kg/da, and the average costs were spraying, fertilizing, harvesting, irrigation, sowing and soil preparation, respectively. The cost of producing one kilogram of cotton was found to be 1.68 TL/kg. The average revenue per decare was found to be 3970 TL/da and the production cost was 945 TL/da. It has been determined that the mechanized harvesting system is more advantageous than manual harvesting according to harvesting cost, total cost and net profit values. For cotton production to be commercially sustainable, it is essential to enhance efficiency in production, determine support measures for cotton that do not adversely affect farmers in the current period, and prioritize mechanized harvesting methods.

Keywords: Cotton, Harvest, Yield, Cost, Profitability

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INTRODUCTION

Agricultural products have become the raw material of not only the food sector but also for many other sectors with the increasing population growth and the development of technology. Cotton has also become an important industrial plant providing raw material to many sectors with different usage areas. It is an industrial plant, which is very important in the economies of countries contributing to the production of textile with cotton fiber, oil production with seeds, and also for the animal husbandry with its pulp. According to the data of the International Cotton Advisory Committee (ICAC), the top 6 countries in cotton production in 2019/2020 in the world were China, India, the USA, Brazil, Pakistan, and Turkey (ICAC, 2020a). According to Turkish Statistical Institute 2019 data, fiber cotton production was 814000 tons in Turkey. Şanlıurfa, however, realized approximately 37% of the total production of fiber cotton with 300906 tons (TSI, 2021). Turkey imports cotton much more than it produces. According to TUIK data, it was estimated that 2.2 million tons of seed cotton were produced in our country in 2019/20 period, and the amount of fiber cotton corresponding to this amount was 814 thousand tons. The consumption coverage ratio of production increased to 63% in 2018/19, it decreased to 50% in 2019/20 (Republic of Turkiye Ministry of Trade, 2022). Cotton contributes to employment and is an important source of revenues for farmers as well as being important in national economies. The Turkish textile industry is an indispensable sector with its added value, the amount of foreign currency that textile exports bring to the economy of the country, and the employment volume created with the labor-intensive workforce. The strategic raw material of our textile industry, which is the locomotive sector of our country, is made up of cotton (Republic of Turkiye Ministry of Trade, 2022). Cotton has great economic importance for humanity with widespread and compulsory usage areas and for producer countries with the added value and employment opportunities it brings with it (Gencer et al., 2005). The textile and ready-made clothing sector made up approximately 25% of the total industrial employment as of 2011 (National Cotton Council, 2021a). It is important to increase the economic added value of cotton for countries and farmers. The agricultural policies of the countries, the use of proper techniques in cotton

production and harvesting, etc. affects the economic added value of cotton. Especially technical and economic inadequacies in harvesting and post-harvest storage and in ginning steps and the deficiency in practice cause great losses in the added value of all segments from agriculture to industry in cotton production (National Cotton Council, 2021b). Sawgin Machinery should be preferred as it has better effects on cotton quality characteristics (Sağlam et al., 2021). It was also reported that cotton was more exposed to natural conditions such as humidity, dew, rain, and sun with machine harvesting later than in manual harvesting, which causes the fiber color to become dull and the trash ratio high (Terzi & Kaynak, 2019). In another study, it was reported that farmers followed the substitute product price in cotton production, and the price increased in the substitute product affected the cotton supply negatively (Özüdoğru & Miran, 2015). It was also reported that despite the continuous increase in input costs in cotton production, the variability in output prices had negative effects on the profitability and sustainability of production (Belay et al., 2020).

In the present study, an economic analysis of cotton production was made in Şanlıurfa for the 2020/2021 period. The costs from sowing to harvesting of cotton in 15 enterprises were determined for economic analysis, and the revenues obtained directly or indirectly were compared by making statistical analyzes. Economic comparisons were also made between hand harvesting and machine harvesting.

MATERIALS AND METHODS

Cotton production fields

The main material of the study was the data obtained from 15 cotton enterprises, which were consulted in Haliliye and Eyyubiye Districts of the province of Şanlıurfa in 2020/2021 period. The net revenues were obtained by following the revenues-cost values in the whole process from the sowing of the cotton to the harvest and post-harvest sales to make the economic analysis of cotton. In general, statistical comparisons were also made between hand harvesting and machine harvesting besides the economic analysis.

Statistical analyses

Harvesting was performed by machine in 11 of the 15 identified enterprises, and by hand, in 4 of these. Statistical analyses were performed to examine the effects of harvesting methods on revenues-cost balance and the factors affecting net revenues. In the present study, descriptive statistics are given as mean, standard deviation, percentage, and frequency; and the Mann Whitney U Test was used to examine the difference in revenues-cost according to the harvest method. The All-Pairwise Method was used to determine the different groups; and the Spearman Correlation Analysis was used to examine the factors affecting net revenues. The critical decision value was taken to be 0.05 in the analyses, which were made with the SPSS 25.00 Package Program.

RESULTS AND DISCUSSION

The data from 15 businesses in 2020/2021 period

The revenues and costs tables were created as a result of the data received from 15 businesses in 2020/2021 period. The revenues-costs statements are given in Tables 1 and 2.

The data in the cotton revenues-expenditure table were obtained by following all the transactions from the sowing to the sales of cotton instantly. The sales price of the product from 1 decare (TL/da) was taken into account as direct revenues in the creation of the revenues statements. The supports for 2020/2021 period were taken into account in the indirect revenues. Cotton premium support (TL/da), diesel support (TL/da), and fertilizer support (TL/da)were used as indirect revenues. Many countries provide support for the survival and development of cotton production, which has high commercial importance. The fact that the demand for cotton is more than the production in Turkey requires the activation of the support policy tools for this product (Erdal & Erdal, 2008). Yılmaz & Gül (2015) reported that input costs must be reduced, product incentive premiums and supports must be increased for the development of cotton production. Ali et al. (2012) stated that input costs must be reduced, and support prices must be increased so that cotton producers do not face losses. According to ICAC data, the top 5 countries supporting the cotton industry in the 2019/2020 season were China, the USA, India, Turkey, and Greece, respectively. The support of Turkey to the cotton industry amounted to $232 million. No payments were made for uncertified seeds since the 2012/13 season. The premium paid for seed cotton produced from certified seeds remained unchanged at 0.8 Turkish Liras (TL/kg) in 2018/19 and 2019/20 (ICAC, 2020b). The decision on the agricultural supports to be made in 2020 was published in the Official Gazette with the number of 3190 on 05.11.2020. In this respect, it was decided to provide 62 TL diesel and 4 TL fertilizer support per decare for cotton (Anonymous, 2021a). However, amendments were made by abolishing the 3190 decision on 05.11.2020 regarding the supports. This amendment was published in the Official Gazette with the decision number 3589 on 05.03.2021 (Anonymous, 2021b). According to the final decision, 62 TL diesel and 8 TL fertilizer support would be given per decare. The seed cotton premium was determined to be 1.1 TL/kg. The Republic of Turkiye Ministry of Agriculture and Forestry announced for 2020/2021 season that the seed cotton premium was increased by 37.5% to 1.1 Turkish Liras per kilogram (TOB, 2021). The cotton support premium (500×1.1) per decare was determined to be 550 TL/da because there was a 500 kg cotton restriction per decare.

Table 1. Revenue Table of Cotton Production

Lands	Harvest method	Cotton species	Sowing area (da)	Yield (kg /da)	Unit price (TL/ kg)	Revenues				
						Premium support (TL/da)	Diesel support (TL/da)	fertilizer support (TL/da)	Selling price (TL/da)	Total revenue (TL/da)
1	Machine	Candia	100	650	6.2	550	62	8	4030	4650
2	Machine	Bomba	43	550	5.5	550	62	8	3025	3645
3	Machine	St 468	55	570	6.4	550	62	8	3648	4268
4	Machine	Fiona	95	600	6.7	550	62	8	4020	4640
5	Machine	Candia	75	600	6	550	62	8	3600	4220
6	Machine	Fiona	200	630	6.5	550	62	8	4095	4715
7	Machine	St 468	50	600	6.2	550	62	8	3720	4340
8	Machine	Set 499	40	500	6.5	550	62	8	3250	3870
9	Machine	Candia	100	660	6.3	550	62	8	4158	4778
10	Machine	Bomba	78	550	5.8	550	62	8	3190	3810
11	Machine	Candia	155	575	6.4	550	62	8	3680	4300
12	Hand	Candia	25	500	5	550	62	8	2500	3120
13	Hand	Candia	30	450	4.8	495	62	8	2160	2725
14	Hand	Candia	37	540	5.5	550	62	8	2970	3590
15	Hand	Candia	20	460	5	506	62	8	2300	2876
Average			74	562	6	543	62	8	3356	3970

Table 2. Costs of Cotton Production

Lands	Costs						Total costs (TL/da)	Net revenues (TL/da)
	Soil preparation (Diesel) (TL/da)	Sowing (Diesel+Seed) (TL/da)	Spraying (Diesel+Pesticide) (TL/da)	Fertilizing (Diesel+ Fertilizer) (TL/da)	Irrigation (TL/da)	Harvest (TL/da)		
1	28	55	317.5	268.5	70	150	889	3761
2	21	55.5	238	260	70	120	764.5	2880.5
3	19.25	60	272	250	70	140	811.25	3456.75
4	30	67	271	270	70	150	858	3782
5	21	55.5	341	260	70	160	907.5	3312.5
6	17.5	55	320	250	70	150	862.5	3852.5
7	30	65	280	270	70	140	855	3485
8	37.8	52	270	235	70	120	784.8	3085.2
9	28	60	350	275	70	150	933	3845
10	21	55.5	290	260	70	120	816.5	2993.5
11	20	60	272	250	70	140	812	3488
12	36	66	270	245	70	700	1387	1733
13	30	65	200	260	70	750	1375	1405
14	15	52.75	294	264	70	405	1100.75	2489.25
15	28	56	240	260	70	375	1029	1891
Average	25.5	58.68	281.7	258.5	70	251.33	945.72	3030.68

The expenses for soil preparation, sowing, spraying, fertilization, irrigation, and harvesting were taken into account for the costs table. The average expenses were found to be spraying, fertilizing, harvesting, irrigation, sowing, and soil preparation, respectively, from highest to lowest rate in the present study (Ali et al., 2012). It was found that cotton input costs were, land rental, pesticides, irrigation, fertilization, weed control, and seeds, respectively (Yılmaz & Gül, 2015). The first among the material costs of cotton production was the cost of pesticides that had a share of 7.2%, followed by the cost of fertilizer (6.7%), and water (4.0%), respectively (Yılmaz & Demircan, 2005). Reddy et al. (2018) reported that the most important factors affecting the cost increase in cotton production were manpower and fertilizers and also mechanization must be improved and fertilizer must be used wisely to reduce manpower and fertilizer costs. Parlakay et al. (2021) stated that there is an excessive input usage in cotton production with irrigation (36.79%), fertiliser-N (17.88%), and pesticide (8.22%).

According to the data obtained from 15 enterprises for 2020-2021 period, the cost of producing 1 kg cotton was found to be 1.68 TL/kg. Uğurlu (2020) reported that the cost of producing 1 kilogram seed cotton was 2.17 TL/kg. The seed cotton production costs (TL/kg) between 2010 and 2020 were 1.088, 1.254, 1.71, 1.71, 1.82, 1.96, 2.1, 2.34, 3.55 and 4.07, respectively (Republic of Turkiye Ministry of Trade, 2022).

According to Table 2, the average production cost of cotton was found 945 TL/da. Candemir et al. (2017) stated that the average cotton production cost was 856.64 TL/da with the data obtained from 42 cotton enterprises in Kahramanmaraş in 2013.

The data from 15 businesses in 2020/2021 period

The Spearman Correlation Analysis was made to analyze the factors affecting the net revenues in cotton production. The results are given in Table 3.

Table 3. Factors affecting the net revenues level

Measurements		Net Revenues (TL/da)
Sowing Area (da)	r	0.696*
	p	0.01
Yield (kg/da)	r	0.905*
	p	0.01
Unit Price (TL/kg)	r	0.938*
	p	0.01
Premium Support (TL/da)	r	0.706*
	p	0.01
Selling Price (TL/da)	r	0.983*
	p	0.01
Total Revenue (TL/da)	r	0.984*
	p	0.01
Soil Preparation (Diesel) (TL/da)	r	-0.27
	p	0.34
Sowing (Diesel+Seed) (TL/da)	r	-0.15
	p	0.59
Spraying (Diesel+Pesticide) (TL/da)	r	0.687*
	p	0.01
Fertilizing (Diesel+ Fertilizer) (TL/da)	r	0.24
	p	0.39
Harvest (TL/da)	r	-0.877*
	p	0.01
Total Costs (TL\da)	r	-0.799*
	p	0.01

*Significant relation at 0.05 level

It was found that the net revenues levels were correlated positively and strongly with cultivation area (p=0.01); and that the net gains of the products with higher cultivation area would be higher.

It was observed that net revenues levels were correlated positively and strongly with productivity (p=0.01); and that the net gains of the products with high efficiency would be higher.

It was determined that the net revenues levels were correlated positively and strongly with the Sales Price (TL/kg) (p=0.01); and that the net earnings of products with higher Sales Prices (TL/kg) would be higher.

It was found that net revenues levels were correlated positively and strongly with Premium Support (TL/da) (p=0.01); and that the net earnings of products with higher Premium Support (TL/da) would be higher.

It was determined that the net revenues levels were correlated positively and strongly with the Sales Price per Decare (TL/da) (p=0.01); and that the net earnings of products with higher Sales Price per Decare (TL/da) would be higher.

The net revenues levels were found to be correlated positively and strongly with Total Revenues (TL/da) (p=0.01); and that the net earnings of products with higher Total Revenues (TL da-1) would be higher.

Soil Preparation (Diesel) (TL/da) and Sowing (Diesel+Seed) (TL/da) costs were not significantly associated with the net revenues (p>0.05)

It was found that the net revenues levels were correlated positively and strongly with Spraying (Diesel+ Pesticide) (TL/da) (p=0.01).

Fertilization (Diesel+Fertilizer) (TL/da) costs were not significantly related to net revenues (p>0.05).

It was found that the net revenues levels were correlated negatively and strongly with Harvest (TL/da) (p=0.01), and the net gains of the products with high harvest (TL/da) would be lower.

It was found that net revenues levels were correlated negatively and strongly with Total Expenses (TL/da) (p=0.01). It was observed that the net earnings of products with higher Total Expenses (TL/da) would be lower.

According to this result, it was also found that methods to reduce expenses must be applied to increase the net revenues. Reddy et al. (2018) stated that real-time soil analysis tests and the use of integrated pest control methods would be beneficial in reducing fertilizer prices.

Economic analysis of harvest methods

The Mann-Whitney U Test was used to analyze the harvesting methods in economic terms. The results are given in Table 4.

Table 4. Analysis of revenues and costs according to the harvest method

Measurements	Harvest method		p
	Hand	Machine	
	X±s.d.	X±s.d.	
Unit price (TL/kg)	5.08±0.30	6.23±0.35	0.24
Premium support (TL/da)	525.25±28.93	550±0.01	0.35
Selling price (TL/da)	2482.5±353.68	3674.18±387.49	0.01*
Total revenue (TL/da)	3077.75±378.29	4294.18±387.49	0.01*
Soil preparation (Diesel) (TL/da)	27.25±8.85	24.87±6.28	0.32
Sowing (Diesel+Seed) (TL/da)	59.94±6.57	58.23±4.63	0.48
Spraying (Diesel+Pesticide) (TL/da)	251±40.55	292.86±34.61	0.06
Fertilizing (Diesel+ Fertilizer) (TL/da)	257.25±8.38	258.95±11.88	0.29
Harvest (TL/da)	557.50±194.87	140.00±14.14	0.01*
Total costs (TL/da)	1222.94±184.92	844.91±52.26	0.01*
Net revenues (TL/da)	1879.56±454.07	3449.27±348.19	0.01*

*Significant at 0.05 level

It was found that sales price measurements and premium support revenues were not at different levels according to the method of harvesting by hand and machine ($p>0.05$).

It was determined that the sales price per decare and the total revenues levels were at different levels according to the harvesting method. It was also found that the sales price per decare and total revenues levels were higher in machine harvesting methods ($p=0.01$).

It was found that the costs of Diesel, Sowing, Spraying, and Fertilization in Soil Preparation were not at different levels when compared to manual and machine harvesting methods ($p>0.05$).

It was determined that there are differences in the rates of harvesting expenses, total expenses, and net revenues according to the manual and machine harvesting methods. The reason for the difference was found to be the fact that the harvest costs and net gains were lower in the manual harvesting method and the total costs were higher ($p=0.01$). As a conclusion, it was found that the machine harvesting system is more efficient when compared to manual harvesting in terms of harvesting costs, total costs, and net revenues. Yılmaz & Gül (2015) reported that the total labor costs decreased with the increased size of the land, and the reason for this was that machine harvesting was preferred and the labor costs were more economical compared to manual harvesting. There has been a significant decrease in the number of cotton pickers coming to the GAP area in recent years because of the partial transition to irrigated agriculture. Labor problems are pushing producers towards machine harvesting. However, the lack of infrastructure and information makes it difficult to switch to machine harvesting in addition to the expensive picking machines to be used in the harvest. Contracting services related to the problem must be supported, machinery access must be included in the scope of incentives, and producers must be provided with low-interest and long-term loans to purchase harvesters (Gencer et al., 2005).

CONCLUSION

In the present study, the input-output analysis of cotton production was investigated by using statistical methods as a result of the data obtained from 15 farmers who produced cotton in Şanlıurfa in 2020/2021 period.

- It was found that the average yield was 562 kg/da in cotton production for product per decare.
- The average sales price of 1 kg cotton was found to be 6 TL/kg.
- A total of 11 out of 15 farmers preferred machine harvesting, and 4 preferred manual harvesting.
- The average revenue from cotton production was found to be 3970 TL/da per decare.
- The cost of growing 1 kg cotton was 1.68 TL/kg.
- The production cost in cotton was 945 TL/ha per decare.
- It was found in the study that the average values in the costs for cotton production were spraying, fertilizing, harvesting, irrigation, sowing, and soil preparation, respectively, from the highest to the lowest impact.

As a conclusion, cotton is a commercially important plant for countries. For this reason, it was concluded that we need to increase productivity, and cotton supports must be determined in sufficient amounts not to harm farmers for the current period and in order for cotton production to be commercially sustainable. There are especially two methods that must be applied to increase productivity. The first is to increase the amount of cotton production; and the other is to make effort to reduce production costs.

Compliance with Ethical Standards

Peer-review

Externally peer-reviewed.

Declaration of Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contribution

The author read and approved the final manuscript. The author verifies that the Text, Figures, and Tables are original and that they have not been published before.

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