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ECONOMIC ANALYSIS OF CUT FLOWER PRODUCTION (CARNATION, GERBERA AND LISIANTHUS) IN TURKEY: THE CASE OF ANTALYA PROVINCE

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Abstract

This research aims to determine the cost and profitability analysis of farmers' greenhouse cut flower (carnation, gerbera and lisianthus) production in Antalya. In 2018, the cut flower production in Antalya province accounted for about 56.04% of Turkey's cut flower production. Snowball sampling methods were used to select the cut flower growers and the sample size was calculated as 53 farmers. The data obtained from the enterprises' cut flower production was obtained by face-to-face interviews with the farmers using the producer questionnaire developed by these researchers. The data for the study was obtained in 2018. According to the study's conclusions, the most important cost factor in the greenhouse cut flower production process in the enterprises interviewed was the variable cost. The variable cost share of the total production cost in carnation production was 56.96%, 59.44% in gerbera production, and 64.03 in lisianthus production. The fixed cost percentage was 43.04%, 40.56% and 35.97%, respectively. As for cost items, the most important elements were permanent labour, fertiliser, seedlings, pesticide and land rent. The relative profit value, which better measures the return of production activities, in greenhouse cut flower production was calculated as 1.47 in carnation enterprises, 1.60 in gerbera enterprises and 1.26 in lisianthus enterprises.

Key words: *carnation, gerbera, lisianthus, cut flower, economic analysis*

INTRODUCTION

Ornamental plants are examined in four subgroups. These are cut flowers, indoor ornamental plants, outdoor ornamental plants, and natural flower bulbs [11].

Cut flowers are more preferred by farmers and consumers than other ornamental plants. Therefore, the demand for cut flower production in Turkey is high [12].

The increase in the level of economic development of countries, the development in the purchasing power of consumers, the increase in the population living in cities and important days (wedding anniversary, mother's day, valentine's day, etc.) increase the demand for luxury goods. This demand also increases the cut flower production [12].

In 2020, cut flowers and potted plants were produced on an area of approximately 750,000 hectares in the world. India ranks first in cut flowers and potted plants production with a share of 41.78% (313,000 ha). India were followed by China with a share of 24.64% (184,586 ha). China were followed by USA of 3.76%, Japan of 2.42%, Brazil of 2.08%, Mexican of 2.00%, Italy of 1.70%, Thailand of 1.64%, South Africa of 1.53%, Ecuador of 1.24%, and Colombia of 1.02% respectively (Fig 1).

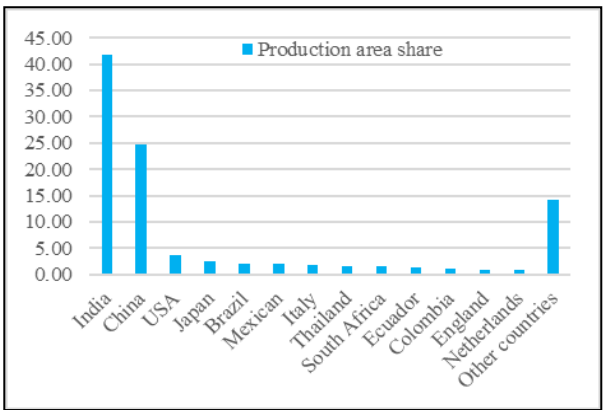

Fig. 1. The share of countries in cut flower and potted plants production area in the world (%)

Source: [3].

In terms of the production quantity of cut flowers in Turkey in 2021, the share of carnation was 56.98%, the share of gerbera was 11.32%, and the share of lisianthus was 1.91%. In terms of production area, the share of carnation was 38.72%, the share of gerbera was 9.24%, and the share of lisianthus was 2.30% (Fig 2).

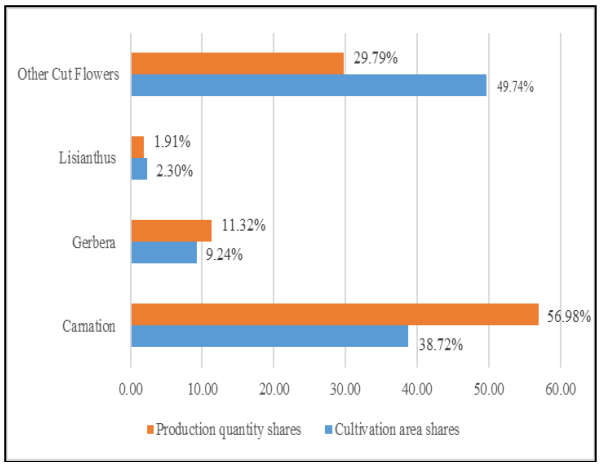

Fig. 2. The share of cut flowers in terms of production quantity and production area in Turkey (%)
Source: [22].

The Mediterranean Region including the province of Antalya, ranks first in cut flower production due to the high average temperature, fertile soil, and proximity to the target market. In addition, due to climatic factors, the greenhouse heating cost of this region is lower than other regions [17].

Cut flower production in greenhouses is common in this region, cut flower production is made for high quality and export-oriented [15].

While the carnation production area in Antalya in 2011 met 55.59% of the production area in Turkey, its share decreased to 51.25% in 2021. While the gerbera production area in Antalya in 2011 met 74.24% of the production area in Turkey, its share increased to 77.17% in 2021. While the lisianthus production area in Antalya in 2011 met 26.83% of the production area in Turkey, its share increased to 38.80% in 2021 (Fig. 3).

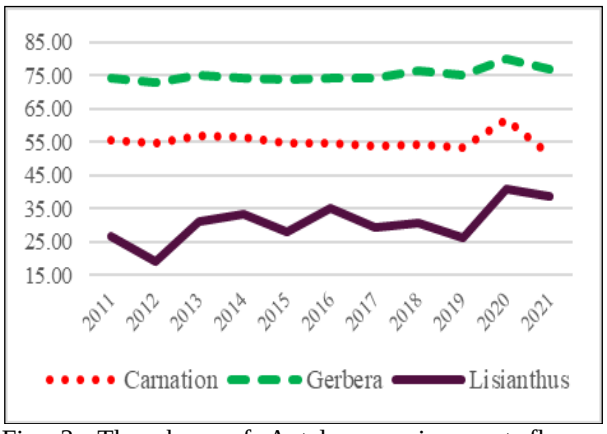

Fig. 3. The share of Antalya province cut flower (carnation, gerbera and lisianthus) production area in Turkey (%)
Source: [22].

While Antalya's carnation production was approximately 49.97% of the total carnation production in Turkey in 2011, its share decreased to 48.07% in 2021. While the gerbera production in Antalya in 2011 met 74.99% of the total production in Turkey, its share increased to 82.25% in 2021. While the lisianthus production in Antalya in 2011 accounted for 33.52% of the total production in Turkey, its share increased to 48.30% in 2021 (Fig. 4).

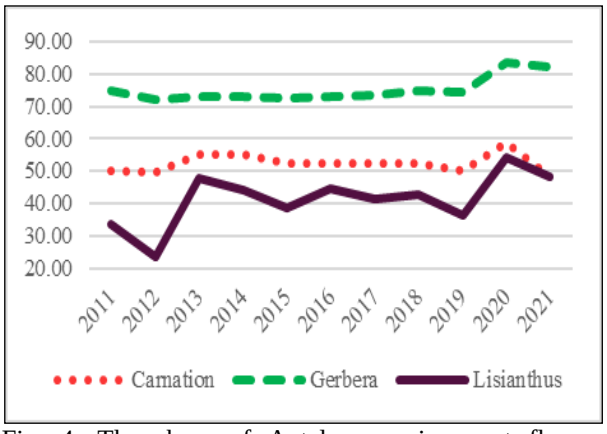

Fig. 4. The share of Antalya province cut flower (carnation, gerbera and lisianthus) production in Turkey (%)
Source: [22].

As a result of the literature review, it was determined that there are many studies on the technical structure [6], [9], [19] and foreign trade [10], [12], [20], [21] of cut flower production, but there are fewer studies on its economic analysis [7], [14].

This study aimed to analyse the technical applications, costs, and profitability of enterprises producing cut flowers in the greenhouses of Antalya.

MATERIALS AND METHODS

The study's primary material was comprised of original data obtained via a face-to-face survey method from 53 cut flower production enterprises in the Antalya province. Since cut flower producers are intense in Altinova Region of Antalya province, survey interviews were conducted in this region.

Survey data belongs to the 2018 production period. In the 2018 production year when the data were collected, Antalya province has 57.58% cut flower production area and 56.04% cut flower production in Turkey [22]. For this reason, these districts were chosen as the research area. In order to calculate the number of farmers to be interviewed in the research, a list of cut flower growers was requested from the Antalya Province Farmer Registration System, but no record was found. For this reason, snowball sampling methods were used in the selection of the sample and the sample size was calculated as 53 farmers.

The average cut flower area of the enterprises was calculated as 9.04 decares for carnation enterprises, 4.00 decares for gerbera enterprises and 2.46 decares for lisianthus enterprises (Table 1).

In calculating the cost and profitability of the enterprises, the calculations were made after the answers were received through face-to-face surveys with the farmers. Single product budget analysis was used in the cut flower cost analysis.

The variable cost consisted of fertiliser, seedlings, pesticide, machine rental, temporary labour, electricity (for irrigation), other variable costs, and the interest in working capital. Permanent-family labour, land rent, establishment capital interest, establishment depreciation value and general administration expenses made up the fixed cost.

The gross production value was calculated by multiplying the cut flower production of the enterprises with the sales price. The daily wage paid to the wage labourer in the region was taken as a precedent in calculating the enterprise's daily wages for the enterprise owner and his family members. 3% of the total variable cost was the general administrative expenses [1] [13].

The gross profit was calculated by subtracting the variable costs from the gross production value, and the net profit was calculated by subtracting the production costs [4] [16].

The relative profit was calculated by dividing the gross production value by the production cost [13]. The exchange rate for 2018 was 1 US dollar = 4.82 Turkish Lira (TRY).

Table 1. Sample size

Cut flower type	Cut flower production area (decare)*	Number of enterprises**	Percent
Carnation	9.04	25	47.17
Gerbera	4.00	32	60.38
Lisianthus	2.46	11	20.75

*1 decares = 0.1 hectares **In some enterprises, cut flower types were produced together
Source: Own calculation.

RESULTS AND DISCUSSIONS

Since greenhouse soils' physical and chemical properties are very different from each other, fertilization applied without soil analysis causes various problems in cut flower production [5]. For this reason, the application of soil analysis in greenhouse soils will prevent problems in cut flower production. The soil analysis status of the enterprises within the scope of the research was examined, and it was determined that 16.98% of the enterprises applied soil analysis. It was determined that 88.68% of the enterprises applied foliar fertiliser and 60.38% applied animal manure (Table 2).

In the interviewed enterprises, it was determined that the enterprises that applied soil analysis had a low rate and that the enterprises that made fertilisation had a high

rate (Table 2). This situation showed that cut flower producing enterprises had fertilization applications without soil analysis.

Non-operating agricultural income is the income that the capital and labour force of the enterprise are obtained for agricultural purposes outside the enterprise [18]. In other words, it is the income obtained by the enterprises from the agricultural sector except that their own agricultural income. The proportion of cut flower enterprises with non-operating agricultural income was 7.55%, and the proportion of cut flower enterprises with non-agricultural income was 41.51% (Table 2). It was determined that almost half of the enterprises interviewed had non-agricultural incomes. The rate of enterprises producing cut flowers every year was determined at 83.02% (Table 2). Most of the enterprises continue their cut flower production regularly. This showed that farmers who regularly produce cut flowers every year are more experienced.

Table 2. Technical information about cut flower production of enterprises

Indicators	Answers received from enterprises			
	Applying		Not applying	
	N	%	N	%
Soil analysis	9	16.98	44	83.02
Foliar fertiliser	47	88.68	6	11.32
Animal manure	32	60.38	21	39.62
Non-operating agricultural income	4	7.55	49	92.45
Non-agricultural income	22	41.51	31	58.49
Cut flower production every year	44	83.02	9	16.98

Source: Own calculation.

The average production cost was calculated as 38,404.90 TRY in carnation production, 32,095.11 TRY in gerbera production, and 33,038.84 TRY in lisianthus production. The most important cost factor in the greenhouse cut flower production process in the enterprises interviewed was the variable cost. The variable cost share of the total production cost in carnation production was 56.96%, 59.44% in gerbera production, and 64.03 in lisianthus production. The share of fixed costs was 43.04%, 40.56% and 35.97%, respectively. As for cost items, the most important elements were permanent labour, fertiliser, seedlings, pesticide and land rent (Table 3).

Permanent labour costs had the most important share with 24.66% among the factors that constituted the production costs in carnation production. Permanent labour costs were calculated at 9,470.48 TRY per decare in carnation producing enterprises. Permanent labour costs were followed by fertiliser costs with a 13.30% share and 5,107.64 TRY per decare. The seedling cost was calculated at 661.55 TRY per decare in the average of enterprises. The share of seedling costs in production costs was 12.14%. The seedling cost was followed by land rent with a 9.06% share and 3,478.22 TRY per decare. Land rent was followed by machine rental cost of 8.10%, pesticide costs of 7.84%, the temporary labour cost of 5.00%, establishment capital interest of 4.82%, electricity cost (for irrigation) of 4.41%, other variable costs of 3.98%, establishment depreciation value of 2.79%, interest in working capital of 2.19%, and general administration expenses of 1.71%, respectively (Table 3).

Permanent labour costs in gerbera producing enterprises were calculated at 7,472.44 TRY per decare. Its share of the total production cost was 23.28%. Permanent labour costs were followed by seedling costs with a 14.03% share and 4,504.40 TRY per decare. Fertilisation costs were calculated as 4,455.42 TRY per decare in gerbera producing enterprises. The share of fertiliser costs in production costs was 13.88%. Fertiliser cost was followed by pesticide cost with an 11.84% share and 3,800.30 TRY per decare. Pesticide costs were followed by land rent of 9.73%, machine rental cost of 5.80%, the temporary labour cost of 4.87%, electricity cost of 3.66%, establishment capital interest of 3.43%, other variable costs of 3.07%, establishment depreciation value of 2.34%,

interest in working capital of 2.29%, and general administration expenses of 1.78%, respectively (Table 3).

In enterprises producing lisianthus, the permanent labour cost per decare was calculated as 7,650.41 TRY and seedling cost per decare was calculated as 7,643.38 TRY. Their respective percentages of the total production cost were 23.16% and 23.13%. Permanent labour and seedling costs followed by fertiliser costs with a 12.86% share and 4,250.37 TRY per decare. Land rent was calculated at 2,892.56 TRY per decare in gerbera producing enterprises. The share of land rent in production costs was 8.76%. The cost of land rent was followed by the cost of pesticides, which had an 8.00% share and a cost of 2,642.27 TRY per decare. Machine rental costs of 6.65% followed by pesticide costs, temporary labour costs of 5.09%, electricity costs of 2.98%, other variable costs of 2.86%, interest in working capital of 2.46%, general administration expenses of 1.93%, establishment depreciation value of 1.13%, and establishment capital interest of 1.00%, respectively (Table 3).

Table 3. Cut flower production costs per unit area in enterprises

Production costs	**Carnation**	**Gerbera**	**Lisianthus**
	Cost (TRY per decare)		
Fertilisation cost	5,107.64	4,455.42	4,250.37
Seedling cost	4,661.55	4,504.40	7,643.38
Pesticide cost	3,011.12	3,800.30	2,642.27
Machine rental cost	3,112.45	1,862.11	2,198.17
Temporary labour cost	1,920.25	1,560.35	1,680.33
Electricity cost (for irrigation)	1,692.38	1,175.36	983.36
Other variable costs	1,527.44	984.84	944.28
Working capital interest	841.32	733.71	813.69
Total variable cost (1)	*21,874.15*	*19,076.49*	*21,155.85*
Permanent labour cost	9,470.48	7,472.44	7,650.41
Land rent	3,478.22	3,122.33	2,892.56
Establishment capital interest	1,852.52	1,100.43	330.89
Establishment depreciation value	1,073.31	751.13	374.45
General administration expenses	656.22	572.29	634.68
Total fixed cost (2)	*16,530.75*	*13,018.62*	*11,882.99*
Total production costs (1+2)	38,404.90	32,095.11	33,038.84
	The share in the production costs (%)		
Fertilisation cost	13.30	13.88	12.86
Seedling cost	12.14	14.03	23.13
Pesticide cost	7.84	11.84	8.00
Machine rental cost	8.10	5.80	6.65
Temporary labour cost	5.00	4.87	5.09
Electricity cost (for irrigation)	4.41	3.66	2.98
Other variable costs	3.98	3.07	2.86
Working capital interest	2.19	2.29	2.46
Total variable cost (1)	*56.96*	*59.44*	*64.03*
Permanent labour cost	24.66	23.28	23.16
Land rent	9.06	9.73	8.76
Establishment capital interest	4.82	3.43	1.00
Establishment depreciation value	2.79	2.34	1.13
General administration expenses	1.71	1.78	1.92
Total fixed cost (2)	*43.04*	*40.56*	*35.97*
Total production costs (1+2)	100.00	100.00	100.00

Source: Own calculation.

In another study [17] carnation production in Antalya province in 2018, the share of variable cost per decare was 52.33% and the share of the fixed cost was 47.67%. Permanent labour costs (21.62%), pesticide costs (14.10%), fertilisation costs (13.12%), and seedling costs (12.14%) were found to be the essential costs.

In another study [8] conducted on the production of ornamental plants in Samsun, the share of variable costs per decare was

36.82%, while the share of fixed costs was 63.18% for carnation production.

In greenhouse cut flower production, the gross production value per decare was 56,463.76 TRY in carnation enterprises, 51,265.63 TRY in gerbera enterprises and 41,614.32 TRY in lisianthus enterprises (Table 4). Gross profit was found by subtracting the variable cost from the gross production value [2] [13]. The gross profit per decare in greenhouse cut flower production was calculated at 34,589.61 TRY in carnation enterprises, 32,189.14 TRY in gerbera enterprises and 20,458.47 TRY in lisianthus enterprises (Table 4).

The net profit was determined by subtracting the production cost for greenhouse cut flower production from the gross production value [13]. The average net profit of the carnation enterprises was calculated at 18,058.86 TRY per decare. Net profit per decare in lisianthus enterprises was at the lowest level with 8,575.48 TRY and gerbera enterprises had the highest value with 19,170.52 TRY (Table 4).

The cut flower yield per decare was 143,200 branches in carnation enterprises, 106,250 branches in gerbera enterprises and 72,600 branches in lisianthus enterprises (Table 4).

The cost of one branch of cut flowers was 0.27 TRY in carnation enterprises, 0.30 TRY in gerbera enterprises and 0.46 TRY in lisianthus enterprises (Table 4).

The selling price of one branch of cut flowers was 0.39 TRY in carnation enterprises, 0.48 TRY in gerbera enterprises and 0.57 TRY in lisianthus enterprises (Table 4).

The net profit of one branch of cut flowers was calculated at 0.12 TRY in carnation enterprises, 0.18 TRY in gerbera enterprises and 0.11 TRY in lisianthus enterprises (Table 4).

The relative profit was found to be the ratio of the gross value of production to the cost of production [13]. The relative profit in greenhouse cut flower production was calculated as 1.47 in carnation enterprises, 1.60 in gerbera enterprises and 1.26 in lisianthus enterprises (Table 4). The relative profit value calculated for the 2018 production season indicated that the greenhouse cut flower production activity was profitable. A gross production value of 147 TRY was obtained for each 100 TRY production cost in carnation production. Therefore, a profit of 47 TRY was obtained for every 100 TRY production costs. For every 100 TRY of production cost, 60 TRY profit was obtained in gerbera production and 26 TRY of profit was obtained in lisianthus production.

Another study [17] calculated the cost of carnation production per decare at 27,019 TRY, with 129,182 TRY as the yield of carnation per decare, 0.203 TRY per branch of the selling price. According to this study, the cost of decare was high in our study. The reason for the difference in production costs per decare in TRY is that the dollar exchange rate was low in 2017 when the study was conducted. The exchange rate for 2017 was 1 US dollar = 3.64 Turkish Lira. In 2018, the exchange rate increased by about 32%.

Another study [7] calculated the gross production value per decare was found to be 77,164.87 TRY in carnation enterprises, 40,941.18 TRY in gerbera enterprises and 56,056.06 TRY in lisianthus enterprises.

Table 4. Cost and profitability in cut flower production

Costs and profit	Carnation	Gerbera	Lisianthus
1. Total GPV per decares (TRY) (6x8)	56,463.76	51,265.63	41,614.32
2. Variable cost per decares (TRY)	21,874.15	19,076.49	21,155.85
3. Gross profit per decares (TRY) (1-2)	34,589.61	32,189.14	20,458.47
4. Total production costs per decares (TRY)	38,404.90	32,095.11	33,038.84
5. Net profit per decares (TRY) (1-4)	18,058.86	19,170.52	8,575.48
6. Yield (branch/decares)	143,200	106,250	72,600
7. Cut flower cost (TRY/branch) (4/6)	0.27	0.30	0.46
8. Cut flower selling price (TRY/branch)	0.39	0.48	0.57
9. Net profit (TRY/branch) (8-7)	0.12	0.18	0.11
10. Relative profit (1/4)	1.47	1.60	1.26

Source: Own calculation.

The gross profit per decare was calculated as 19,560.81 TRY in carnation enterprises, 3,373.19 TRY in gerbera enterprises and 9,689.39 TRY in lisianthus enterprises. The selling price of one branch was calculated as 0.46 TRY in carnation enterprises, 0.49 TRY in gerbera enterprises and 0.20 TRY in lisianthus enterprises.

CONCLUSIONS

The highest profits in cut flower types were obtained in gerbera enterprises. Carnation and lisianthus enterprises followed. Although it varies according to the cut flower types; permanent labour, fertiliser, pesticide, seedling and land rent constituted the highest expense group. The product with the highest total cost per decare was carnation, and the product with the lowest was gerbera.

As a result, the factors affecting the profitability of the enterprises were determined as the size of the enterprise, the type of cut flower produced and the level of input used.

There is a need for policies to reduce the input costs of enterprises producing cut flowers. For this reason, these issues should be taken into account when determining the policies for cut flower cultivation. The decrease in input costs will increase the profitability of cut flower producing enterprises.

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