

Economics of Cut Flower Production in Greenhouses: Case Study from Turkey

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Abstract: Turkey's cut flower sector is an agricultural production area with a high export potential despite its problems related with production and marketing. Enterprises in this sector may be classified in two groups as enterprises with export towarded production (big-modern enterprises) and with domestic market towarded production (small-family enterprises) according to their structural and economical properties. This study aimed to determine investment and operation-maintenance expenses of 4 different greenhouse enterprises selected from the above-mentioned groups and economical investigation of rose and carnation production of these enterprises. Results of the study indicated that the expenses of big-modern type enterprises with plastic greenhouses decreased 11.36 € m⁻² than the other big-modern type. The biggest investment expenses were observed in the enterprises using geothermal heating; when the incomes of these enterprises were investigated in general rose production along with plastic greenhouses were found to be more profitable. Small-family type enterprises were found to be less profitable due to their low investments. In conclusion size of the enterprise, level of the utilized production technology along with the type of cut flower produced are factors affecting the investments profitability in enterprises producing cut flowers.

Key words: Greenhouse, cut flowers, investment expenses, income-expense balance, production area, Turkey

INTRODUCTION

Cut flowers are one of the most worldwide produced commercial items due to their easiness of transportation and mass production. Fresh cut flowers are one of the most important ornamental plants used in fabrication of bunch of flower, basket and wreath.

The biggest centers for production of cut flowers are Holland, USA, Columbia, Kenya, Zimbabwe, Japan and Israel. Total area for production of ornamental plants in these countries is 223 145 ha. According to Rabo Bank (Holland), the total sale amount for ornamental plants is about 50 billion \$ worldwide. Cut flowers are the leader of the ornamental plants with a total sale amount of 24.7 billion \$ (Malter, 1995).

Production of cut flowers began in 1940s in Yalova and Istanbul and developed in Aegean and Mediterranean regions with the developments in transportation and export capabilities (Karaguzel *et al.*,

2000). The leader of Turkey's cut flower is Marmara region especially Yalova, the other production areas are Izmir in Aegean region and Antalya in Mediterranean region (Table 1). Production in Yalova is towarded to domestic market; production in Antalya is towarded to international markets whereas production of Izmir is both towarded to domestic and international markets. Turkey's cut flower exportation has increased in the last 3 years with a rate of 34% and approached to a total of 40 million \$ in 2006 (Bagdatlioglu, 2007).

About 60% of Turkey's cut flower production is made in greenhouses. Turkey's cut flower production areas are composed of glass greenhouses (6.4%), plastic greenhouses (70.2%). This distribution indicates a philosophy of obtaining maximum benefits from ecological adva open fields (23.4%) ntages rather than the use of glass greenhouses in this country's cut flower production. Carnation is the most produced cut flower

Table 1: Cut flowers production area in Turkey (Ozzambak, 2003)

Year Region	1993		1999		2003	
	Area (da)	(%)	Area (da)	(%)	Area (da)	(%)
Aegean	2518.8	37.62	3268.7	21.5	3365	32.9
Marmara	2403.3	35.90	8700.0	56.9	3502	34.2
Mediterranean	1710.2	25.54	3136.4	20.5	3197	31.2
Others	61.5	0.94	174.7	1.1	174	1.7
Total	6693.8	100.0	15280.3	100.0	10238	100.0

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with a percentage of 44.5% followed by rose 14.4% and the rest consisting of gladiolus, chrysanthemum, gerbera etc.

Cut flower production is made in big-modern type export towarded enterprises along with domestic market towarded small-family type enterprises. Most of the export towarded enterprises use glass or suitable plastic greenhouses, automated irrigation, fertilization and lightning equipments along with cold storage and packaging systems whereas domestic market towarded small-family type enterprises are small sized enterprises utilizing rather simpler technologies. Most of the greenhouses used in production areas are small basic structures with low investments in technology.

The aim of this study is to determine the investment and operation-maintenance expenses for both cut flower production enterprise groups in Turkey and to make an economical investigation for the mostly produced cut flowers; rose and carnation.

MATERIALS AND METHODS

Cut flower production enterprises with a massive production in Izmir and Antalya using glass or plastic greenhouses were investigated in this study. In these recently established enterprises greenhouses have controlled heating, cooling, mist irrigation, CO₂ fertilization and lightning systems. Greenhouses side-wall heights are about 4-5 m in these export towarded enterprises with a ventilation area reaching up to 40%. Most of these enterprises are heated with central heating systems but few use geothermal energy. In addition to ventilation systems; shadowing and fogging units are used to decrease greenhouse temperature (Titiz, 2004). Four different enterprises were selected to be used in this study with keeping the above-mentioned parameters in mind; three of them were big modern enterprises with central heating systems (2 enterprises) and a geothermal heated enterprise; one plastic greenhouse enterprise was chosen to represent the small-family type enterprises. Enterprise characteristics are reprinted in Table 2.

Production areas are more than 30 da, for the big-modern type enterprises whereas less than 5 da for the small-family type enterprises (Karaguzel *et al.*, 2000). In this study, 30 da is chosen to represent production area in big-modern type enterprises and 2 da is chosen to represent small-family type enterprises.

Cut flower production is an agricultural production requiring intense labor hood. Especially, domestic market towarded enterprises are mostly family companies. In these types of enterprises up to 1.8- 2 workers may be hired per da annually (Titiz, 2004).

Most marketed cut flowers are carnations and roses in the world as in Turkey. Target markets' requirements are important in the selection of type of rose produced. Medium head sized roses are more fertile. Medium head sized medium length (grand prix) rose type was selected due to this property. Annual yield for this type of is 160 stem/m². For carnation; calculations were made for the standard carnation having single head per stem and annual yield was calculated as 140 stem m⁻². As cultural processes require more labor hood than rose; the production of carnation is more expensive (Titiz, 2004). For both flower types; production costs were calculated from the 2005 data of production cooperative records.

In the studied greenhouse enterprises; total investment expenses for year 2005 were calculated in respect to their structure and equipments and the obtained expenses were divided to the enterprise size and unit investment expenses were calculated. Five percent of total equipments and machinery costs were used for calculation of amortization expenses; 2% of total product sales are used for calculation of marketing and general expenses and annual inflation rate (8%) is used for calculation of annual interest rate. Production expenses, marketing, transportation, amortization, interest, insurance expense etc. rates were calculated for unit enterprise size to obtain total expenses (Erkus and Rehber, 1996). Total incomes were calculated by multiplying mean yield of cut flowers with mean sales prices.

Table 2: Characteristics of greenhouse enterprises

Enterprise no	Province	Enterprise type	Greenhouse type	Cover material	Total green house area (da)	Heating system	Irrigation system	Shadowing system	Computerized systems	Auxiliary units
1	Antalya	Modern	Wide span block	Glass	25	Central heating	Drip irrigation	Heat curtain	Heating, irrigation, ventilation,	Office, shed, cold storage, packaging department
2		Modern	Arc-roofed block	PE	25	Central heating	Drip irrigation	Heat curtain	Heating, irrigation, fertilization	Office, shed, cold storage, packaging department
3	Izmir	Modern	Wide span block	Glass	25	Central heating with geothermal energy	Drip irrigation	Heat curtain	Heating, irrigation, ventilation, fertilization	Office, shed, cold storage, packaging department
4		Family	Arc-roofed block	PE	1.5	Central heating	Drip irrigation	-	-	-

RESULTS AND DISCUSSION

Investment expenses for three greenhouse enterprises two of which are glass greenhouses heated either with central heating or geothermal energy and a plastic greenhouse representing the big-modern type enterprise group and a plastic greenhouse representing the small-family type enterprise group were calculated in this study. Unit investment expenses represented in Table 3 are calculated by dividing the obtained investment expenses with the size of the enterprise. The results indicate that for the big-modern type enterprise group; operation expenses for the plastic greenhouse enterprises are 11.36 € m⁻² less than the other type. Small-family type enterprises also tend to build plastic greenhouses due to their low costs. Total expenses for the geothermal heated big-modern type enterprise was more than the other enterprises because of the expenses of hot water reservoirs, exchanger systems, heat counters and hot water transportation systems.

The mostly produced cut flowers in Turkey are carnation and roses. Total operation and maintenance expenses for these two flowers in association with the total income obtained from the marketing of these flowers were calculated for the enterprises studied. Sale prices of the cut flowers differ with the type of the flower, quality of the flower and even with the year, month and day of production. Because of this property, annual mean sale prices were used in calculations. Difference between the total income and expense was calculated and unit profits for the enterprises were obtained in Euros (Table 4). In general, rose production is more profitable. This reason can be explained with the high sale prices of the roses. For the big-modern type greenhouse enterprises; plastic type greenhouses are more profitable for rose production. Profit obtained from small-family type enterprises is less than big-modern type enterprises in respect to their low investment expenses. Unit expenses of heating, irrigation and building investments will decrease as the size of the enterprise increases. Because of this reason, an increase

Table 3: Total investment expenses of greenhouse enterprises

	Modern enterprise (1) (€ m ⁻²)	Modern enterprise (2) (€ m ⁻²)	Modern Enterprise (3) (€ m ⁻²)	Family enterprise (4) (€ m ⁻²)
Land consolidation and fencing	2.50	2.50	2.50	1.58
Greenhouse construction (glass)	40.83	-	56.20	-
4mm glass purchase (assembly+transport)	3.50	-	3.50	-
Greenhouse construction (PE)	-	34.03	-	16.66
Greenhouse and cover material assembly costs	2.50	1.50	2.50	1.50
Greenhouse concrete deals, in-lines, drainage	0.83	0.83	-	-
Insect net	0.63	0.88	0.63	-
Greenhouse floor cover	0.23	0.23	0.23	-
Geothermal heat shed	-	-	1.00	-
Rain shed and cushion	-	-	0.80	-
Energy transmission lines and transformer	0.50	0.50	0.50	-
Growing bench production	2.67	2.67	2.67	-
Internal transports	0.58	0.23	1.00	0.23
Greenhouse out lines and layout	0.67	0.67	0.67	0.67
Packaging department shed, office building	2.50	2.50	7.40	1.53
Tool purchase	1.25	1.25	3.00	0.65
Equipment purchase, furnishing	0.67	0.67	6.00	8.95
Total investment expenses	59.86	48.50	88.60	31.77

Table 4: Operating profits of greenhouse enterprises in grown rose and carnation

	Modern enterprise (1) (rose) (€ m ⁻²)	Modern enterprise (2) (rose) (€ m ⁻²)	Modern enterprise (3) (rose) (€ m ⁻²)	Family enterprise (4) (carnation) (€ m ⁻²)	Modern enterprise (1)(carnation)(€ m ⁻²)
Expenditure items					
Fees	3.50	3.00	3.50	0.65	3.56
Plant nutrients	4.50	3.50	4.50	3.78	4.00
Pesticide and predatory insects	1.50	0.40	1.50	0.73	0.30
Energy costs	2.40	2.00	2.40	2.00	2.40
Geothermal heat	-	-	3.50	-	-
Seed-nursery costs	1.58	1.58	1.58	2.83	2.83
Marketing and transport	2.50	2.50	2.50	1.56	1.56
Packaging and cold storage	2.00	2.00	2.00	2.32	2.32
General expenses	1.25	1.25	1.25	0.78	0.78
Interest (%8)	2.32	2.32	2.32	2.32	2.32
Amortization (%5)	2.99	2.43	4.43	1.59	2.99
Insurance	0.50	0.50	0.50	0.50	0.50
Total expenses	25.04	21.48	29.98	19.06	23.56
Income					
Mean yield (stem/m ²)	160	160	160	140	140
Mean sales price (€/stem)	0.39	0.39	0.39	0.28	0.28
Total income	62.40	62.40	62.40	39.20	39.20
Net profit	37.36	40.92	32.42	20.14	15.64

in the enterprise size from 30 da to 60-100 da would be more profitable as the unit investment expenses decrease. As a result, size of the enterprise, level of the utilized production technology and the type of produced cut flower are affecting factors of the profitability of cut flower producing enterprises. When the increase in export opportunities is considered; it can be assumed that cut flower production is a profitable investment branch.

CONCLUSION

Greenhouse enterprises are the most important enterprises requiring labor hood and investment in agricultural production. Structure of the small-family type enterprises in Turkey is not suitable for production of cut flowers adequate both in value and quality season wide. On the other hand, in big-modern type enterprises factors such as the type of the greenhouse, heating system used, the ability of the enterprise to employ a production advisor results with production suitable with the markets requirements at a satisfactory price.

The economical advances and the increase in cut flower exportation by 34% in the last three years led to increase in export-towards expenses in Turkey's big-modern type cut flower production enterprises. It's essential to eliminate the differences in both enterprise types and organization of the cut flower production sector to obtain sustainability in these developments. Production quality of the production enterprises must be

improved in conjunction with supporting studies to decrease their post harvest lost. They must be supported to use new production technologies to decrease unit expenses and to increase in their quality in production and yield. Their foundations must be improved. Producers must be educated in order to improve their production and marketing skills.

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