FACTORS AFFECTING THE PROFITABILITY OF PEACH GROWING IN TURKEY

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Abstract
The purposes of this study are to economic analyse of peach growing in Kemalpasa, Izmir and to determine it's profitable for small farms. Data were collected by survey from 63 farmers by using random sampling. In economical analysis, cost and net profit of peach production were calculated. According to results of this study, average size of the peach orchards was 1.09 ha. Average peach production ha^{-1} and $tree^{-1}$ were determined to be 16,848 kg and 37.7 kg. 63 % of total peach production was marketed in wholesale markets. However, 17 % and 2 % of peaches was sold as direct on trees and in local market places. The rest of peach production was sold to commission agents (8 %), dialers (8 %), fruit juice factories (1 %), and exporters (1 %). Average peach price that received by the farmers was determined to be 0.25 \$ kg^{-1}. Total cost ha^{-1} of peach production was calculated to be \$ 3,373. Net profit obtained ha^{-1} and $tree^{-1}$ from peaches were determined to be \$ 839 and \$ 1.88, respectively.

Key words: peach, orchard, horticulture, marketing, economic analysis.

INTRODUCTION

All peach varieties and types grown in Turkey belong to *Prunus persica*. It encloses economically significant varieties for table consumption and for canning or drying. There are some compact ornamental types of peach with white, red or darker coloured petals or dark red, purple or variegate colored leaves used for ornamental purposes. Peach is one of the most appreciated fruits in Turkey. Besides its fresh consumption all through the summer, it is used in making marmalade, jam or jelly, canned as slices or processed as fruit juice and pulp (Hakan, 2003). Varieties as Lovell and Muit are used in drying whereas Redhaven, Fairhaven, Kalhaven are used in deep-freezing. The fruit characteristics demanded by the Turkish consumers are symmetry, homogeneity in size, yellow flesh, free stone and attractive surface color (Ozbek, 1988).

The number of peach trees and peach production in Turkey are reported as 14 million and as 470,000 tonnes in 2003 (State Institute of Statistics, 2003). The peach production has shown some fluctuations in some years however there has been steady increase between 1988 and 2003. According to statistics of Foreign Trade Export Promotion Center, Turkey exported 44,227 tonnes of peach in 2003. Major markets are: Germany, Russia, Saudi Arabia, Kuwait, Austria and Romania. However, 13 tonnes of peach were imported to Turkey in 2003. The production is projected to be 551,974 tonnes for 2010 (Gülcan et al., 1995).

In recent years, many studies have been done on the economics of peach production (Dizdaroglu, 1985; Gercekcioglu and Esengün, 1991; Ergun et al., 1992; Celebi, 1996; Ozcelik and Sayili, 1998; Cinemre and Kilic, 1999; Akcay and Uzunoz, 1999). According to these studies, peach growing may be profitable for farmers. But farmers should gather all the economic data about the peach production, and market conditions of peaches before decision-making. Also farmers should make investigations on other enterprises and determine if peach growing can be profitable.

In this study, economic analysis of peach growing in Kemalpasa, Izmir were performed and determined it's profitable for small farms. In economic analysis, cost and net profit of peach production were calculated. Further, factor analysis was performed for determining factors affecting the profitability of peach growing.

MATERIALS AND METHODS

This study consisted of surveyed data from farmers in Kemalpasa, Izmir. Kemalpasa was selected according to the production share (20 %) in Izmir province. Four villages were selected from Kemalpasa and data have been collected from 63 farmers by random sampling. Survey started on November 20, 2001 and continued until December 25, 2001.

The general cost items of peach production were classified as variable costs and fixed costs. The variable costs associated with peach production were all inputs that directly relate to the production and covered labor and machine costs, material costs (fertilizer, pesticide, electricity, etc.) and transport costs. In this study, variable costs were calculated by using current inputs and labor wages.

Fixed costs are named as indirect costs or supplementary costs. In this study, peach growing was analysed as an independent production branch. Therefore, interest and depreciation costs of farmers's machines and buildings were not calculated. Fixed costs included interest cost, administrative costs, annual depreciation costs of peach orchards, rent equivalent of land, land tax, and keeper fee. Interest costs estimated to be interest on total variable costs and it was calculated by charging a simple interest rate of 12 % (saving deposits interest rates on US \$). Administrative costs were estimated to be 3 % of the total variable costs. Annual depreciation cost was estimated using the straight-line method. Rent equivalent of land was

estimated to be 5 % of land value. Peach orchards were exempted from property tax and were not insured. In this study, total production costs were subtracted from gross production value to calculate net profit. Factor analysis was performed for determining factors affecting the profitability of peach growing. All the results of this study are given to be average of 63 farms.

RESULTS AND DISCUSSION

Yield

According to results of this study, average size of the peach orchards was 1.09 ha. Average yield obtained from peach orchards was determined to be 16,848 kg ha^{-1} and 37.7 kg $tree^{-1}$. However, in a similar study in Ohio, USA, average yields of peach orchards were determined to be 7,380 kg ha^{-1} (OSU, 2000). Especially, peach production $tree^{-1}$ varies from region to region in Turkey. For example: in a similar study done in Tokat, Turkey, average yield $tree^{-1}$ was determined to be 40.6 kg (Akcay and Uzunöz, 1999). However, in a study done in Samsun, Turkey, average yield $tree^{-1}$ was calculated to be 39.1 kg (Cinemre and Kilic, 1999).

Costs

Costs of peach growing include establishment and production costs. Establishment costs are spreading to three years. Peach trees typically do not produce fruit until the third year or later. Establishment costs cover all the expenses that is relating with the period of the trees having productive capacity. These are generally related with the costs of labor and machines (maintenance, energy, etc). Establishment costs of first, second and third years were determined to be $ 2,355, $ 2,232, and $ 1,477, respectively. However, in a study done in Ohio, USA, before fruit bearing cost (for 2-3 years) ha^{-1} was calculated to be $ 2,298 (OSU, 2000).

Production costs consist of both variable and fixed cost. Productive years of peach had been accepted 20 years. The portion of labor costs on peach is extremely high (Table 1). Labor is used for maintenance, harvestings, classification, and transport. Average production cost ha^{-1} was determined to be $ 3,373. Variable costs and fixed costs formed 56.2 % and 43.8 % of total costs. In addition, labor, fertilizer, and pesticide costs were 45.3 %, 10.9 %, and 10.7 % of total variable costs, respectively. However, in a study done in Ohio, USA, average production cost ha^{-1} was determined to be $ 5,190 (OSU, 2000). In a similar study done in Florida, USA, it was estimated to be $ 12,375 (Crocker et al., 1997).

Total production costs ha^{-1} of peach were determined in similar studies in other regions of Turkey. But, results of these studies are different from one to one another. For example: in three studies done in Tokat, Turkey, it was determined to be $ 887 (Gercekcioglu and Esengün, 1991), $ 5,578 (Ozcelik and Sayili, 1998), and $ 2,663 (Akcay and Uzunoz, 1999), respectively. In a study done in Samsun, Turkey, it was calculated to be $ 3,857 (Cinemre and Kilic, 1999). However, in a similar study done in Bursa, Samsun and Izmir, Turkey, it was estimated to be $ 2,150 (Ergun et al., 1992).

In this study, cost to produce 1 kg of peach was calculated to be $ 0.20 ($ 3,373/ 16,848 kg = $ 0.20). However, it was reported that the cost of production of 1 kg of peach were determined to be $ 0.22 in Samsun (Cinemre and Kilic, 1999), $ 0.16 (Akcay and Uzunoz, 1999) and $ 0.49 (Ozcelik and Sayili, 1998) in Tokat, Turkey. On the other hand, in a similar study done in Ohio, USA, it was estimated to be $ 0.70 (OSU, 2000).

Marketing and Prices

Market emphasis is on consumer demand for high quality, tree-ripened peaches ready to eat when purchased. Today's peach market demands large fruit, preferably 2-1/4 inches in diameter or larger, free of insect and disease blemishes, and attractive, with good shape, color and maturity. Kemalpasa produces less fruit than is consumed within Izmir province. The presence of major metropolitan areas permits farmers to take advantage of these prime markets without hauling fruit for long distances. Most peaches grown in the state are marketed by the individual grower. Farmers utilize a number of market outlets, including sales to local supermarkets, roadside stands, brokers and wholesalers, as well as direct sales from orchards. Many farmers market a large portion of their crop retail because of greater profits. Wooden boxes are used for wholesale marketing, but many farmers utilize viol or smaller containers for retail sales.

In this study, it was observed that more than % 82 of farmers (52 farmers) harvested their crop themselves. 11 farmers marketed their crops as direct sales on trees from orchards. According to results of this study, 63 % of total peach production was marketed in wholesale markets. However, 17 % and 2 % of peaches was sold as direct on trees and in local market places. The rest of peach production was sold to commission agents (8 %), dialers (8 %), fruit juice factories (1 %), and exporters (1 %).

In this study, average peach price that received by the farmers was calculated to be 0.25 $ kg^{-1}. It was determined that peach price varied between 0.10 $ kg^{-1} – 0.49 $ kg^{-1}. Average peach prices were determined to be 0.36 $ kg^{-1} (Cinemre and Kilic, 1999) in Samsun, 0.27 $ kg^{-1} (Akcay and Uzunoz, 1999) and 0.54 $ kg^{-1} (Ozcelik and Sayili, 1998) in Tokat, 0.29 $ kg^{-1} (Ergun et al., 1992) in Bursa, Samsun and Izmir, Turkey. However, in a similar study done in Utah, USA, average organic and conventional peach prices were determined to be 1.85 $ kg^{-1} and 0.70 $ kg^{-1} (Rader et al., 1985).

Gross Production Value and Net Profit

Gross production value obtained ha^{-1} from peaches was calculated to be $ 4,212 in this study. If total production costs were subtracted from gross production value, average net profit obtained ha^{-1} from peaches can be calculated to be $ 839 (Table 1). According to results of this study, there are average 447 trees in one

hectare. Thus, average net profit tree^{-1} was calculated to be $ 1.88 ($ 839/447). However, average net profit obtained ha^{-1} from peaches was estimated to be $ 671 (Ozcelik and Sayili, 1998) and $ 1,390 (Akcay and Uzunoz, 1999) in Tokat, Turkey.

Analysis of Factors Affecting the Profitability

In this study, factor analysis was performed for determining factors affecting the net profit obtained from peach growing. Factor analysis is a mathematical tool which can be used to examine a wide range of data sets. It has been used in disciplines as diverse as chemistry, sociology, economics, psychology and the analysis of the performance of race horses. This tutorial is designed to provide a basic understanding of the principles underlying factor analysis. The focus of the tutorial is the analysis of a 'factor space' or 'data space'. It was written to introduce the undergraduate chemistry major to the basic concept of a 'data space' and to demonstrate how factor analysis can be used to study a 'data space'. As an aid to conceptualization a geometric approach is used wherever possible and the actual linear algebra involved is illustrated (Sharma, 1996).

Many statistical methods are used to study the relation between independent and dependent variables. Factor analysis is different; it is used to study the patterns of relationship among many dependent variables, with the goal of discovering something about the nature of the independent variables that affect them, even though those independent variables were not measured directly. Thus answers obtained by factor analysis are necessarily more hypothetical and tentative than is true when independent variables are observed directly. The main applications of factor analytic techniques are: (1) to reduce the number of variables and (2) to detect structure in the relationships between variables, that is to classify variables (Hair et al., 1992).

The clearer the true factor structure, the smaller the sample size needed to discover it. But it would be very difficult to discover even a very clear and simple factor structure with fewer than about 50 cases, and 100 or more cases would be much preferable for a less clear structure. The rules about number of variables are very different for factor analysis than for regression. In factor analysis it is perfectly okay to have many more variables than cases. In fact, generally speaking the more variables the better, so long as the variables remain relevant to the underlying factors.

In this study, 12 dependent variables were determined for factor analysis as follow. Data of variables was obtained from 63 farms:

X_1: Peach orchard size (ha)
X_2: Number of treee
X_3: Peach production (kg)
X_4: Labor cost ($)
X_5: Fertilizer cost ($)
X_6: Pesticide cost ($)
X_7: Number of irrigation
X_8: Number of plowing
X_9: Number of deep hoeing
X_{10}: Price of peaches ($ kg^{-1})
X_{11}: Transport cost
X_{12}: Education level of farmers

According to the results of factor analysis, 6 factors which have a high eigenvalue (more than 1) were determined (Table 2). The eigenvalue for a given factor measures the variance in all the variables which is accounted for by that factor. The ratio of eigenvalues is the ratio of explanatory importance of the factors with respect to the variables. If a factor has a low eigenvalue, then it is contributing little to the explanation of variances in the variables and may be ignored as redundant with more important factors.

Factor 1, 2, 3, 4, 5 and 6 accounted for 17.4 %, 14.0 %, 12.9 %, 9.7 %, 8.6 %, and 8.3 % of the variance.

These factors as cumulative accounted for % 70.9 of the variance.

According to rotation results of factor analysis, labor cost, fertilizer cost, and pesticide cost form Factor 1 and this factor was named to be "*input use factor*". Number of irrigation and deep hoing form Factor 2 and this factor was named to be "*technical factor*". Number of plowing and education level of farmers form Factor 3 and this factor was named to be "*social factor*". Peach orchard size forms Factor 4 and this factor was named to be "*land factor*". Number of tree and price of peaches form Factor 5 and this factor was named to be "*price factor*". Peach production and transport cost form Factor 6 and this factor was named to be "*productivity factor*" (Table 3).

CONCLUSION

This research has been successful in determining profitable of peach production and economical problems of farmers. In peach production, success depends on how well the farmer can manage the crop and make the right decisions at the right time. In addition, total supply, consumer demand, pricing, perishability of the product, and market structures are other factors that contribute to a farmer's ability to sell his/her product. Therefore, production and market risks both affect the profitability and economic viability of peaches. Farmers must evaluate circumstances to determine if the lower price usually paid by wholesalers and exporters is sufficient to cover production and handling costs and can be profitable. According to this study, peach production may be profitable. But farmers should gather all the economic data about the peach production, and market conditions. Also farmers should make investigations on other orchards and determine if peach production can be profitable.

Peach growing is popular for the small farmers of the region, especially where production space or farm equipment is limited. But, there are problems associated with peach production and marketing

according to farmers. Problems during production are increase of input prices, ineffective of pesticides, increase of irrigation costs, lack of technical information of farmers, Increase of credit interest, variations of climate conditions, and rapidly spread of insect and diseases. Problems during marketing are increase of transporting costs, decrease of peach prices, distance of wholesale markets, legal deductions in wholesale markets, irregular payments in wholesale markets, there is not a deep freeze depot in region, and there is not a sales cooperative in region.

Understanding the causes of problems can give some idea of the type of research that is needed to improve the production of peach. Some suggestions can be given to improve the production of peach in the region. For example; the early varieties should be adopted, suitable planting spaces should be determined, farmers should be informed about Integrated Pest Management, contracting farming system should be developed, irrigation cooperatives should be improved, deep freeze depots should be constructed, farmers should be informed about crop insurance, sales cooperatives should be established, credit limits should be increased and interest of credit should be decreased, and organic peach production should be encouraged.

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Tab. 1. : Production costs of peach growing and obtained net profit ($ ha^{-1})

Items		Total ($)
1.Variable costs	Plowing	174
	Fertilizing	64
	Fertilizer	207
	Pruning and rarefying	133
	Irrigation	141
	Hoeing	75
	Pesticide application	74
	Pesticide	203
	Electricity	200
	Harvesting and packing	372
	Wooden boxes	131
	Transport	123
	Total	1,897
2. Fixed costs	Interest on total variable costs (12 %)	228
	Administrative costs (3 %)	57
	Rent equivalent of land	820
	Annual depreciation costs (*)	347
	Land tax	10
	Keeper fee	14
	Total	1,476
3. Total costs (1+2)		3,373
4. Gross production value		4,212
5. Net profit (4-3)		839

(*) The economic life of peach plantations was estimated as 20 years.

Tab. 2. : The results of factor analysis

Variables	Factor	Eigen value	Variance	Cumulative variance
Peach orchard size	1	2.09395	17.44961	17.44961
Number of tree	2	1.67938	13.99482	31.44443
Peach production	3	1.54557	12.87977	44.32420
Labor cost	4	1.15935	9.66122	53.98542
Fertilizer cost	5	1.03003	8.58359	62.56901
Pesticide costs	6	1.00008	8.33399	70.90300
Number of irrigation	7	0.86110	7.17584	78.07884
Number of plowing	8	0.66604	5.55032	83.62917
Number of deep hoing	9	0.55065	4.58872	88.21789
Price of peaches	10	0.53938	4.49487	92.71276
Transport costs	11	0.51326	4.27720	96.98996
Education level of farmers	12	0.36121	3.01004	100.00000
Barlett's Test of Sphericity: χ^2: 90.569, p:0.024 Kaiser-Meyer-Olkin Measure of Sampling Adequacy: 0.524				

Tab. 3. : Rotation results of factor analysis

Variables	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Peach orchard size	-0.16223	0.00033	0.00070	**0.77826**	-0.00076	0.00011
Number of tree	-0.20054	-0.00023	0.00032	-0.15942	**0.87773**	-0.00031
Peach production	0.37247	0.32269	0.43653	-0.00017	0.00093	**0.45385**
Labor cost	**0.71795**	-0.14265	-0.23118	-0.11048	-0.26594	-0.00019
Fertilizer cost	**0.79161**	0.00072	0.12571	0.00020	0.00069	0.18439
Pesticide costs	**0.65277**	0.14927	-0.00018	-0.16061	-0.00071	-0.33845
Number of irrigation	-0.00014	**0.77823**	0.00019	0.38292	-0.00073	-0.16657
Number of plowing	0.00010	0.14716	**0.81406**	-0.00063	-0.00063	-0.00080
Number of deep hoing	-0.00061	**-0.79174**	-0.00046	0.18492	0.00059	-0.00048
Price of peaches	0.16129	0.00080	-0.33614	0.48246	**0.57379**	-0.16876
Transport costs	-0.00052	-0.00086	-0.00095	-0.00037	-0.10957	**0.88823**
Education level of farmers	-0.15191	-0.30313	**0.63616**	0.43618	0.00042	-0.00030
Variance	17.44961	13.99482	12.87977	9.66122	8.58359	8.33399
Cumulative variance	17.44961	31.44443	44.32420	53.98542	62.56901	70.90300
Eigen value	2.09395	1.67938	1.54557	1.15935	1.03003	1.00008