The valuation of walnut orchards: a case study for Istanbul, Turkey.

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Abstract

The aim of this study is to calculate walnut production costs and to evaluate the walnut orchards according to income method in Istanbul. For this purpose, various data has been obtained by making a questionnaire made with 48 farmers determined by simple random sampling method. Using the income method, the bare land value of walnut orchards, tree values and the economic life of walnut trees were calculated. The method of past values was used in determining the value with trees. The capitalization interest rate that can be used in the research is determined as 3.54%, but the calculations have been based on the rates of 4% and 5%.

Keywords: Walnut production cost. Capitalization interest rate. Net profit.

1. Introduction

Turkey has territories both in Europe and Asia and it has a lot of regions which ecological differences. Turkey's total agricultural land is 38.38 million hectares. 15.57 million hectares (40.58%) of grain production land, 4 million hectares (10.55%) of fallow land, 804 thousand hectares (2.10%) of vegetable land, 5 thousand hectare ornamental crops land, 3.2 million hectares (8.41%) of fruit and beverage and spice plants land, 14.6 million hectares (38.09%) meadow and pasture land. In addition, there are 22.3 million hectares of forest area (TUIK 2017).

Production of hard-shell fruit stands for a significant amount of total fruit production in Turkey. In 2016, total hard-shell fruit production is 934.750 tons. The share of the walnut production is 20.86% of total hard-shell fruit production and it is 195.000 tons (TUIK 2017). It is seen that walnut production has an important role in the production of hard-shell fruit in

Turkey. Walnut production is steadily increasing and walnut orchards are being founded in different parts of Turkey. These developments show that walnut production is likely to be more important in the near future.

Another issue that needs to be considered in agricultural production is the valuation of these orchards. Today, in Turkey valuation is most commonly utilized in areas of expropriation. Although there are plenty of studies and legal regulations on this issue, there are problems in practice. Besides, it is of particular importance to evaluate the fruit orchards. Valuation in perennial plants is an issue that needs to be approached with precision over other crop production areas. More studies are needed to help researchers who deal with it to resolve the problems in practice.

In the valuation of agricultural lands, the market value method and income method are widely applied. In order to apply the market value method, the trading values of similar agricultural lands to be appraised must be taken into consideration. Thus, in the case of expropriation, when the price of the land is paid according to the market value, the land owner will have the opportunity to purchase a land similar to his land. However, the absence of a specific market for agricultural enterprises and land makes it difficult to implement this method. Income method is a method based on the income of the goods. In this method, the asset to be valued must be a continuous income generating commodity. In accordance with the expropriation law, there is an obligation to appreciate the value of agricultural lands according to the income method. However, in applying the income method, reliable accounting data about the land and the correct capitalization interest rate applied in the region where the land is located are needed. In many developed countries, there is a regular accounting system, trading values are determined and this data is published at the end of each year (Demirci et al. 2002).

In the last decade, numerous studies have been carried out to determine the technical and economic aspects of fruit production in Turkey. However, it is seen that the researches on the valuation of the fruit orchards are almost negligible. Nevertheless, there is a great need for research on this subject. Particularly, regional researches on the basis of which principles and approaches can be used in the valuation of fruit orchards are likely to provide significant contributions (Engindeniz 2003).

In the orchards, the appraisal has a different structure. Fruit trees cover a long period of life. Therefore, the income obtained is periodic. Therefore, periodic revenues should be

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taken as basis in the net income account by the valuation commissions and experts (Gülten 1994; Mülayim 2008; Rehber 2012).

Some studies which explain methods in the evaluation of fruit orchards with theoretical aspects have been carried out (Angın 1989; Gülten 1994; Mülayim 2008; Rehber 2012). Studies on the analysis of fruit production cost Büyükarıkan and Gül, 2014; Demircan et al 2016; Bakhshinejad 2016a; Bakhshinejad 2016b. When the applied studies on the valuation of the orchards according to the income method are analyzed, it is seen that there is a limited number such as Angın 1989; Özüdoğru 1998; Engindeniz 2003; Keskin 2003; Engindeniz et al. 2010, Gündoğmuş and Uyar 2016.

In the valuation of fruit orchards, agricultural valuation methods are applied. These methods can be sorted as the market value method, cost method, and income method. The aim of this study is to calculate walnut production costs and to evaluate the walnut orchards according to income method in Istanbul. Accordingly, it is to calculate the capitalization interest rate to be used for valuation in the region.

This is the first study on the valuation of the walnut garden in the region and also it is one of the few studies in Turkey, the implementation of the income method. The study is expected to contribute to expropriation and expertise studies in the region.

2. Literature Review

There are numerous studies on the fruit production cost and economic analysis in the literature. Büyükarıkan and Gül (2014) analyzed the certified nursery producing enterprises in temperate climate fruits. According to results of the study, 79050 seedlings were produced in the enterprises with apple being the highest which accounted for 81.03 percent out of the total production. The gross productions value was TL 359,228.60, TL 173,687.67 was also for production costs and the gross profit accounted as TL 289,465.86 while the absolute profit and relative profit amounted to TL 185,540.93 and 2.07 respectively. Yahaya et al., (2015) conducted the economic analysis of cacao production in Ghana. Results of the analysis showed that the average production cost of cocoa was GHC 1.34 per kg and profit margin was GHC 1.80 per kg in cocoa producer enterprises.

The gross margin and net profit were calculated as GHC 956.78 and GHC 621.24 per hectare respectively. Relative profit was calculated as 1.49 which indicates that cocoa production in the study area is profitable. Demircan et al., (2016) compared the cost and

profitability of organic and conventional apple nursery tree growing. Results showed that cultivation cost per decare and nursery tree via conventional methods was lower than the cost through organic production. A comparison between various applications of organic apple nursery tree cultivation showed that solid organic fertilizer farming practice yielded lowest cultivation cost. In terms of net profit, conventional cultivation brought along higher net profit per decare and nursery tree.

A comparison within various applications of organic cultivation indicated that solid organic fertilizer and liquid organic fertilizer was the most advantageous practice. Yılmaz et al., (2017) analyzed the socioeconomic situations, costs and profitability of farms which applied or did not implement good agricultural practices in citrus cultivating in Adana. According to their findings, unit production costs are higher in farms implementing good agricultural practices.

The relative profit in good agricultural practices implementing farms involved in lemon cultivating is 1.15 while it is 1.22 in farms which do not implement good agricultural practices; and it is 1.19 in mandarin cultivating farms which do and do not implement good agricultural practices. It was found out that the citrus cultivating was profitable in both forms of cultivating. Unakitan et al., (2018) conducted the cost analyses of the different plant constructions type of cherry production the Thrace region of Turkey. According to study, there are two different plant constructions in the region as IV years and VII years.

While IV years plant costs is 6378,69 TL/da, VIII years plant costs is 8989,88 TL/da. Although both types of production are economically profitable, it is seen that the enterprises that produce table cherry with IV-year plant structure have the highest net profits (652,52 TL/da). Aydın and Aktürk (2018) compared the peach and cherry production cost regarding good agricultural practices in their study. According to the economic analysis results, the relative profits in peach production were found as 1.88 and 1.82, respectively. The relative profits in cherry production were found as 2.05 and 2.00, respectively. According to the results, peach and cherry production by good agricultural practices in the region appeared to be more advantageous agricultural activity.

There is a limited number of study can be found in the literature about valuation the fruit orchards. Studies are mostly for the valuation of crop lands. Casler and White (1982) studied the approaches used in different countries in the valuation of perennial plants in a study they conducted. On the basis of different approaches; The differences in income and expense items considered in the net income account and the differences in the interest rates

taken as basis. Rehber (1984) explained the methods used in the appraisal of agricultural lands in his research calculated the capitalization interest rate for the research region by applying the described methods to the business data.

In the research conducted, the data collected through a total of 27 questionnaires in three villages in the province of Nevşehir, which was selected as the research region, were analyzed in terms of businesses with and without a tractor and taking into account all businesses. Aras (1994), in his study stated the way to be used in the valuation of immovable property in expropriation, and especially addressed the issues of determination and selection of the interest rate to be used in the assessment.

The valuation is based on the net income of the land. However, he stated that it is difficult to calculate net income and to choose the rate to be used in capitalization. Hurma (2000) tried to identify the difficulties encountered in the application of income method in agricultural land after industrial and urban development in his study. According to the research, in the region, rent for dry land was found as 5% and rent for irrigated lands was found as 4%. Özüdoğru (1998) in his study, the value of sour cherry orchard was determined according to both the market value method and the income method to the past and future values method. Capitalization interest rate was found to be 5% for the region, but it was used in calculations by increasing it to 7%. The economic life for cherry trees was 24. Engindeniz (2003) conducted the valuation of the fig orchards in Tire province of Turkey.

According to the study, average gross income of fig orchards for productive years was found to be $ 1,860 per hectare and $ 9 per tree. Gross income is expressed by the total yield multiple the average price of dried fig. Net profit is calculated by deduction from the total gross income all such costs within the production period. Net profit of fig orchards was found to be $ 372 /hectare and $ 3/tree. Engindeniz et al., (2010) conducted the valuation of olive orchards in Manisa province of Turkey. In this study, average gross production value of olive orchards for productive years was found to be $3107.58 per hectare and $11.10 per tree.

Net income is calculated by deduction from the total gross production value all such costs within the production period. This value is the income of fix assets. Net income of olive orchards was found to be $1960.18/hectare and $7.00/tree. According to the results of this study, it was found out that land value with trees of olive orchards calculated over net income and a rate of 5.32% was more high then the values calculated by sales comparison approach. Gündoğmuş and Uyar (2016) conducted the valuation of the chestnut orchards in Aydın

province of Turkey. In studied region, the average capitalization rate for chestnut orchards is calculated as 6.42 %.

According to capitalization rate of 6,42 %, the average chestnut orchard values varies between 6,508.27 TL and 9,602.46 TL in the age range of 6 to 80. On the same capitalization rate, the unit value of chestnut trees is calculated between 184.92 TL and 492.54 TL in the age range of 6 to 80. Okan and Engindeniz (2016) evaluated the peach orchards by income method in Selcuk district of Izmir. In this research, tree and land values of peach orchards in Selçuk district of Izmir. In the study, the average capitalization rate for the research region was calculated as 5.75%. Land value without tree of peach orchards was calculated as 5758.24 TL/da and 4546.42 TL/da in 6% and 7% capitalization rates, respectively. Tree and land values for 5, 10 and 15 ages of peach orchards were determined.

3. Material and Method
3.1. Material

According to the information obtained from the Ministry of Food, Agriculture and Livestock, Silivri District Directorate of Agriculture, there are 67 producers registered in the farmers' registration system in the research region. Within the scope of the survey, it is planned to conduct surveys with all producers in the region. However, it is seen that many producers have left production and 48 producers continue to walnut production and a survey has been conducted with these producers.

In order to determine the market value of the land and to determine the rate of capitalization, the lands that were sold recently (in last year) and the properties of these lands and their prices were determined. The data were obtained from the Ministry of Agriculture and Forestry, Provincial and District Directorates of Agriculture, District Land Registry Office, municipalities, cooperatives, real estate agencies, village headmen and producers.

Since the walnut orchards in the research area could not be found sold in the last one year, instead of this, it was seen that 5 watery lands were sold and 4-year sowing alternation was made. In this alternation, wheat, barley, silage corn, sunflower, and watermelon were used. A survey was conducted on the production costs, product amounts and production values with these orchards owners. Analyzes were made and capitalization interest rate (*CIR*) was used to calculate the interest rate.

3.2. Method

In the orchards, the valuation varies according to the lands type where the annual plants are located. Fruit trees have a long lifespan. Therefore, the income obtained is periodic. Hence, periodical income should be taken as a basis by the valuation commissions and the experts in the net income account (Mülayim 2008; Rehber 2012).

In the study, firstly walnut yields were determined considering tree ages. Because of this, it was given high importance on walnut trees` production periods. The average yields for trees of the same age were taken into account at this stage.

Consider the tree ages and periods of production the average costs were determined. Thus, the cost of plant facility and production periods in walnut trees has been revealed. In this process, labor and mechanization costs, material costs (drugs, fertilizers, etc.), the interest of the total costs, management cost and other costs (rent, protection, etc.) are considered as cost elements (Kıral et al., 1999). In the calculation of labor costs, wages paid for temporary workers in enterprises are added to the family labor allowance. In the calculation of material costs, input costs used by producers and current prices paid for these inputs are taken into consideration. Half of the interest rate (6,5 %) used by Turkish Ziraat Bank for farmers was taken into account in 2015 (Kıral et al. 1999; Mülayim 2008). 3% of total costs were taken for the calculation of management cost. In general approach; it is accepted that the production costs of fruits are fixed after the plant facility period (Angın 1989; Akın 1991; Mülayim 2008).

The net income is the remaining earning after deducting the operating costs from the gross value of agricultural enterprises in a year. This value is the common return of the land and other capital elements used in the enterprise for the activity in the mentioned period. In other words, the net income consists of the sum of the land rent and the other capital elements. If the share of revenue is deducted from the interest rate applicable to the capital other than the land value, the net income from the share of the land remains, which is also called the land rent or the net rent of the land (Aras 1994). In the study, the average gross production values of the fruit trees according to the age of the average production and production costs deducted in the relevant years, the average net income obtained according to age was determined. For this reason, the following formula has been used (Mülayim 2008);

Land Rent (Net Income) = Gross Production Value (-) Total Costs

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Net income was calculated by using the Compound Interest Factor (*CIF*) to the end of the period and then to the end of the economic life.

Another factor to be calculated in the study is the capitalization rate. The capitalization rate may vary depending on the region and even the land area and land purchase status in the same region. In order to determine the rate of capitalization, sales of a large number of similar land were determined in the region. Then, the average capitalization rate was calculated by proportioning the net income of these lands to the sales values.

In the study, the bare value of the walnut orchards (K_0) was calculated by utilizing the total fixed periodic net income ($\sum R$). For this purpose, the following formula has been used (Mülayim 2008);

$$K_0 = \frac{\sum_{0}^{n} R}{q^n - 1}$$

where; q: F + 1, n: economic life.

In the study, according to the income method in the valuation of the walnut orchards of age *t*, past value methods were used.

According to the method of past values, K_0 bare value, at the beginning of the life of the fruit orchard was taken into account and this value was taken to the valuation moment with ($K_0 \times q_t$) formula. Then, the amount obtained by accumulating the annual net income from the beginning of the life to the year of *t* was extracted from this value. If the year *t* is close to the beginning of the economic life, generally the past values method is used. This method is formulated as follows (Mülayim 2008);

$$K_t = \frac{\sum_{0}^{n} R}{q^n - 1} \times q^t - \sum_{0}^{t} R \quad \text{or} \quad K_t = (K_0 \times q^t) - \sum_{0}^{t} R$$

According to the method of future values; K_0 bare value of the orchard was taken into account and K_0 value was changed to Kt. Thus, the amount which is obtained by accumulating the rent from year *t* until the end of its life is added to the obtained value. If year *t* is near the end of its economic life, then the future value method is usually used. This method is formulated as follows (Mülayim 2008)

$$K_t = \frac{\sum_0^n R}{q^n - 1} \times \frac{1}{q^{n-t}} + \sum_n^t R \quad \text{or} \quad K_t = K_0 \times \frac{1}{q^{n-t}} + \sum_n^t R$$

After the bare value is extracted from the tree-based value obtained in different ages according to the income method in walnut orchards, the remaining value is determined by the number of trees in each decare and the tree values in different ages are found. This situation can be formulated as follows (Angın 1989; Mülayim 2008);

$$tree\ value = \frac{K_t - K_0}{tree\ quantity\ per\ decare}$$

4. Research Findings

The land size of the walnut orchards is between 1 and 469 decare in the research area. The average land per producer is 28.63 decare and the number of trees per producer is 426.95. Also, the quantity of trees per decare is 14.91.

The economic life of walnut orchards up to 25 years in foreign varieties and 50 years in domestic varieties depending on the type of planted walnut. The producers have preferred 25 years of walnut varieties in the research area.

4.1. Gross production value

As a result of the research, the walnut yields obtained according to the tree ages were multiplied by the average walnut price (20 TL/kg) and the gross production values obtained per tree at different ages were determined. As can be seen from Table 1, income was not obtained from the trees between the ages of 1 and 5, the gross production value increased in the ages of 6 to 9, reached the highest values in ages between 10 and 20 and decrease between the ages of 21 and 25 depending on the production.

Table 1: Gross production values

Ages of Tree	Average Yield (kg/tree)	Average Yield (kg/da)	Gross Production Value (TL/Tree)	Gross Production Value (TL/da)
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	5.64	84.09	112.80	1681.80
7	8.00	119.28	160.00	2385.60
8	10.26	152.98	205.20	3059.60

9	15.72	234.39	314.40	4687.80
10 - 20	17.56	261.82	351.20	5236.40
21	15.72	234.39	314.40	4687.80
22	10.26	152.98	205.20	3059.60
23	8.00	119.28	160.00	2385.60
24	5.64	84.09	112.80	1681.80
25	4.00	59.64	80.00	1192.80

4.2. Land rent (net income)

Because the walnut is a perennial plant, in the calculation of the rent, first of all, the calculation was made for the plant facility period and then for the walnut production period. Table 2 gives the calculation of the cost of the plant facility period.

Table 2: Costs of plant facility period (TL/da)

Processes	Year 1	Year 2	Year 3	Year 4	Year 5
Fertilization					
Fertilizer Discharge	26.96				
Fertilizer Handling	27.09				
Fertilizer Laying	18.97				
Land Processing					
Plowing	44.93	44.93	44.93	44.93	44.93
Reiterative	42.27	42.27	42.27	42.27	42.27
In-term plowing	44.32	44.32	44.32	44.32	44.32
Deep Hoe	17.31	17.31	17.31	17.31	17.31
Planting					
Marking the Planted Place	19.13				
Trenching	29.76				
Planting	32.78				
Sapling	291.72				
Sapling Renewing	-	32.60	32.60	32.60	32.60
Irrigation					
Irrigation System Repair		18.19	18.19	18.19	18.19
Irrigation Labor	21.35	21.35	21.35	21.35	21.35
Irrigation Cost	108.56	108.56	108.56	108.56	108.56
Drip Irrigation Material	285.27	-	-	-	-
Fertilizers					
Farm Manure	75.99	-	-	-	-
DAP - DAP	-	26.96	26.96	26.96	26.96
Pesticides					
SO2	34.23	34.23	34.23	34.23	34.23
Fungicide	33.84	33.84	33.84	33.84	33.84
Herbicide	39.13	39.13	39.13	39.13	39.13
Other Costs					
Wire Fencing	565.27	-	-	-	-
Pruning	-	20.58	20.58	20.58	20.58
Total Production Costs	1758.88	484.27	484.27	484.27	484.27
Interest for costs - (% 6,5)	114.33	31.48	31.48	31.48	31.48
Management cost (3%)	52.77	14.53	14.53	14.53	14.53
Other (Tax, Protection, etc.)	57.52	57.52	57.52	57.52	57.52
Total Facility Cost	1983.5	587.80	587.80	587.80	587.80

The calculation of the net profit for the production period is given in Table 3. As can be seen in Table 1, Table 3 includes the calculations made by taking into consideration that the yield of walnut trees increased up to 10th years, the highest yield between 10-20 years and the decrease in tree yield from the 21st year.

Table 2: Net profit for production period (TL/da)

Production Cost Elements	Years 6 and 24	Years 7 and 23	Years 8 and 22	Years 9 and 21	Years 10 and 20	Year 25
Land Processing						
In-term Plowing	40.93	40.93	40.93	40.93	40.93	40.93
Deep Hoe	21.72	21.72	21.72	21.72	21.72	21.72
Harvest	51.29	51.29	51.29	51.29	51.29	51.29
Irrigation						
Irrigation System Repair	25.15	25.15	25.15	25.15	25.15	25.15
Irrigation Labor	27.69	27.69	27.69	27.69	27.69	27.69
Irrigation Cost	143.61	143.61	143.61	143.61	143.61	143.61
Maintenance						
Sapling Renewing Labor	12.65	12.65	12.65	12.65	12.65	12.65
Dilution	22.83	22.83	22.83	22.83	22.83	22.83
Transportation	47.24	47.24	47.24	47.24	47.24	47.24
Sapling Renewing	17.08	17.08	17.08	17.08	17.08	17.08
Fertilizers						
DAP	47.56	47.56	47.56	47.56	47.56	47.56
Pesticides						
Herbicide	25.84	25.84	25.84	25.84	25.84	25.84
Fungicide	18.64	18.64	18.64	18.64	18.64	18.64
SO2	37.62	37.62	37.62	37.62	37.62	37.62
Other Costs						
Dismantling Costs	-	-	-	-	-	70.00
Total Production Costs	539.85	539.85	539.85	539.85	539.85	609.85
Interest for Total Cost (%6,5)	35.09	35.09	35.09	35.09	35.09	39.64
Total Variable Costs	574.94	574.94	574.94	574.94	574.94	649.49
Management Cost (3%)	17.25	17.25	17.25	17.25	17.25	19.48
Other (Land Tax, Protection, etc.)	57.52	57.52	57.52	57.52	57.52	57.52
Other Costs	74.77	74.77	74.77	74.77	74.77	77.00
Total Costs	649.71	649.71	649.71	649.71	649.71	726.49
Yield	84.09	119.28	152.98	234.39	261.82	59.64
Price	20.00	20.00	20.00	20.00	20.00	20.00
Gross Production Value	1681.80	2385.60	3059.60	4687.80	5236.40	1192.80
Gross Profit	1106.86	1810.66	2484.66	4112.86	4661.46	543.31
Net Profit	1032.09	1735.89	2409.89	4038.09	4586.69	466.31

In order to calculate the rents obtained from per decare of walnut orchard according to tree ages, firstly the gross production values obtained from per decare of walnut orchard should be determined according to tree ages. As stated earlier, in the region generally 10 m x 10 m planting range (30.30%) or 7 m x 7 m planting range (24.37%) in foreign varieties are used, and therefore there are mostly 15 trees in average in the decare. Therefore, gross production values were determined according to the different ages of the trees. Then, total rent is calculated by subtracting the costs (plant facility and production costs) from the gross

production value. As shown in Table 4, for the first 5 years there is no yield, consequently rent is negative. Rent is positive after the 6th year and it is increasing up to 10th years. It is the highest level since it is the normal production period between the 10th and 20th years. After the 21st year, it decreases.

Table 3: Rents according to ages of tree

Ages of Tree	Gross Production Value (TL/da)	Total Cost (TL/da)	Total Rent (TL/da)
1	-	-1.983.50	-1.983.50
2	-	-587.8	-587.8
3	-	-587.8	-587.8
4	-	-587.8	-587.8
5	-	-587.8	-587.8
6	1681.80	-649.71	1032.09
7	2385.60	-649.71	1735.89
8	3059.60	-649.71	2409.89
9	4687.80	-649.71	4038.09
10 -20	5236.40	-649.71	4586.69
21	4687.80	-649.71	4038.09
22	3059.60	-649.71	2409.89
23	2385.60	-649.71	1735.89
24	1681.80	-649.71	1032.09
25	1192.80	-726.49	466.31

4.3. Valuation Based on Income Method

4.3.1. Determination of capitalization interest rate

The capitalization interest rate is defined as the reserve of the capital invested in the land (Mülayim 2008). In order to determine the capitalization interest rate, it is necessary to know the sales prices of many similar lands. For example, if the sales prices in a region are indicated by $K_1, K_2, K_3, …, K_n$ the rent rates of the lands $R_1, R_2, R_3, …, R_n$ the capitalization interest rate (F) can be calculated as follows (Mülayim 2008);

$$F = \frac{R_1 + R_2 + R_3 + ... + R_n}{K_1 + K_2 + K_3 + ... + K_n} = \frac{\sum R}{\sum K}$$

In this research, it was tried to determine the capitalization interest rate (*CIR*) by determining the lands recently sold in the region. However, the sale of land in the region has decreased considerably in the last few years. According to the surveys, 5 agricultural lands in the region were identified in the last year. In Table 5, sales prices of these lands and their rents obtained from these lands are given.

In addition, according to the researches conducted in the region, the total rent for the wheat, barley, silage corn, sunflower and watermelon grown in the Silivri region was calculated (Table 5). Net income was determined as 378.03 TL in wheat, 299.89 TL in barley, 823.07 TL in silage corn, 341.90 TL in sunflower, and 2361.71 TL in watermelon per decare.

Table 4: Capitalization interest rate of different type farms

Land size	Agricultural Form Applied in the Field	Total Rent (TL)	Land Value (TL)	Capitalization Interest Rate
5	(Wheat + Silage Corn) + (Sunflower)	3857.51	175000	%2.21
10	(Barley + Silage Corn) + (Watermelon)	17423.37	420000	%4.15
15	(Sunflower) + (Watermelon)	20277.07	580000	%3.50
20	(Barley + Silage Corn) + (Watermelon)	34846.75	850000	%4.09
40	(Wheat + Silage Corn) + (Sunflower) + (Watermelon)	52062.90	1600000	%3.25
Total		128467.61	3625000	

When the total rent obtained from the recently sold land is proportioned as the sum of the sales prices of the land, considering the limited number of sold land, the capitalization interest rate that can be used for the region can be calculated as follows in the watery area.

CIR=Total Rent / Total Land Value =128467.61 / 3625000 = 0.0354 (%3.54)

A capitalization interest rate is generally given with approximate numbers. On the other hand, when the positive and negative factors affecting the value of land are taken into consideration, capitalization can be changed by increasing or decreasing the interest rate. In particular, it is recommended to increase the capitalization interest rate slightly while valuation the fruit orchards (Mülayim 2008). Thus, the capitalization interest rate per land was calculated and interest rates close to 4% and 5% were found. From this point of view, it is thought that the capitalization interest rate should be rounded and the 4% and 5% ratios should be taken as the basis and the results should be compared comparatively. In a study on fig orchards in Tire district of İzmir, the capitalization interest rate was found to be 5.56, and then it was rounded to 6%, 7%, 8% and 9% (Engindeniz 2003). Similarly, in a survey conducted in peach orchards in the Selçuk district of İzmir, the capitalization interest rate was found to be 5.75 and rounded to 6% and 7% (Okan and Engindeniz 2013).

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4.3.2. Determination of bare land value in walnut orchards

The following formula (Mülayim 2008) has been used to determine the bare land value of walnut orchards in the study;

$$K_0 = \frac{\sum_0^n R}{q^n - 1}$$

where; K_0 = Bare land value of walnut orchards, $\sum (R)$ = Total rent obtained from trees in walnut orchards, n = Economic life, q = The compound interest factor.

In the study, the rents obtained from walnut orchards as plant facility period (1-5 years), increase period (6-9), normal production period (10-20), and decrease period (21-25) were first accumulated at the end of the relevant period using Compound Interest Factor (*CIF*) (Table 6.).

CIF represents to $(1 + f)^n$. Here, n represents the number of years, and f represents the capitalization interest rate. In the study, q is used to instead of $(1 + f)$, and depending on the number of years the related compound interest factors are shown with (q^n).

Table 5: Periodical values of rents obtained from walnut lands (TL/da)

Period	Age	Rent (TL/da)	CIF (q^n)	Periodical Value of Rent (TL/da)*	
				% 4	% 5
Plant Facility	1	-1983.50	q^4	-2320.50	-2410.94
Period	2	-587.80	q^3	-661.22	-680.44
	3	-587.80	q^2	-635.76	-648.05
	4	-587.80	q^1	-611.31	-617.19
	5	-587.80	q^0	-587.80	-587.80
			Total	-4816.59	-4944.42
Increase	6	1032.09	q^3	1161.00	1194.75
period	7	1735.89	q^2	1877.54	1913.82
	8	2409.89	q^1	2506.29	2530.38
	9	4038.09	q^0	4038.09	4038.09
			Total	9582.92	9677.04
Normal Production Period **	10-20	4586.69	$(q^{11}-1)/f$	61857.94	65162.19
			Total	61857.94	65162.19
Decrease	21	4038.09	q^4	4724.16	4908.30
Period	22	2409.89	q^3	2710.89	2789.69
	23	1735.89	q^2	1877.54	1913.82
	24	1032.09	q^1	1073.37	1083.69
	25	466.31	q^0	466.31	466.31
Total				10852.27	11161.81

(*) Calculated by multiplying the rent by the relevant factor values.
(**) The normal production period continues for 11 years (20-9) which is determined by extracting the first year from the last year. These annuities, which are obtained on an equal basis each year, have been added to end of period by using the Annual Compound Interest Factor (ACIF).

As shown in Table 7, the rents brought to the end of the period are calculated by using the *CIF* according to the number of years to the end of the life. By adding the values at the end of life, the end-of-life value of the total rent is calculated.

ACIF is expressed as $ACIF = \dfrac{q^n - 1}{f}$ (Angin, 1989). In the study, n=11 and *f* were calculated by taking 4% and 5% respectively (Table 7).

Table 7: Lifetime values of the rents (TL/da)

Period	Capitalization Interest Rate (f)	Total Value of Rent (TL/da)	CİF (q^n)	Total Rent of Lifetime (TL / da)
Planting Period	% 4	-4816.59	q^{20}	-10553.63
	% 5	-4944.42	q^{20}	-13119.03
Increase Period	% 4	9582.92	q^{16}	17948.81
	% 5	9677.04	q^{16}	21124.01
Normal Production Period	% 4	61857.94	q^{5}	75262.56
	% 5	65162.19	q^{5}	83166.50
Decrease Period	% 4	10852.27	q^{0}	10852.27
	% 5	11161.81	q^{0}	11161.81
Total	% 4	-	-	93510.01
	% 5	-	-	102333.29

Estimated end of the economic lifetime values ($\sum R$) for walnut lands were placed in the above formula, and bare land values (K_0) based on capitalization interest rate over 25 years of economic life were determined as in Table 8.

Table 8: Barel land values of walnut lands (TL/da)

Capitalization Interest Rate (%)	Lifetime Value of Rent (TL/da)	Bare Land Value (K_0) (TL/da)
% 4	93510.01	56135.20
% 5	102333.29	42881.86

3.3.3. Determination of values of the walnut orchards according to tree age

Most of the trees in the surveyed areas are between 6 and 10 years old. Therefore, K_6 and K_{10} values were obtained by using the calculated K_0 values. For this purpose, the past value method was used.

As shown in Table 9 and Table 10, firstly the rents ($\sum R$) obtained from the lands until the trees become 6 (Table 9) and 10 (Table 10) years old were added to the end of the 6th and 10th years using the related *CIF* coefficient.

Table 6: Rents obtained from trees in walnut orchards until 6th Age

Age	Rent (TL/da)	CIF (q^n)	Rent at the End of 6th Age (TL / da)	
			% 4	% 5
1	-1983.50	q^5	-2413.32	-2531.54
2	-587.80	q^4	-687.67	-714.47
3	-587.80	q^3	-661.22	-680.44
4	-587.80	q^2	-635.76	-648.05
5	-587.80	q^1	-611.31	-617.19
6	1032.09	q^0	1032.09	-1032.09
Total			-3977,19	-4159.60

Table 10: Rents obtained from trees in walnut orchards until 10th Age

Age	Rent (TL / da)	CIF (q^n)	Rent at the end of 10th Age (TL / da)	
			% 4	% 5
1	-1983.50	q^9	-2823.12	-3077.00
2	-587.80	q^8	-804.46	-868.47
3	-587.80	q^7	-773.49	-827.09
4	-587.80	q^6	-743.74	-787.71
5	-587.80	q^5	-715.18	-750.21
6	1032.09	q^4	1207.44	1254.51
7	1735.89	q^3	1952.70	2009.47
8	2409.89	q^2	2606.54	2656.90
9	4038.09	q^1	4199.61	4239.99
10	4586.69	q^0	4586.69	4586.69
Total			8.692.99	8.437.08

The rent determined in this way is substituted in the above formulas and the K_6 and K_{10} values according to the interest rates are calculated as in Table 11.

Table 7: K_6 and K_{10} values of walnut orchards

Capitalization Interest Rate (f)	Bare Land Value (K_0) (TL/da)	CIF (q^n)	Total Rent at the end of the age 6 ($\sum$R) (TL / da)	K_6 (TL/da)
% 4	56135.20	q^6	-3977.19	75005.06
% 5	42881.86	q^6	-4159.60	61625.58
Capitalization Interest Rate (f)	Bare Land Value (K_0) (TL/da)	CIF (q^n)	Total Rent at the end of the age 10 ($\sum$R) (TL / da)	K_{10} (TL/da)
% 4	56135.20	q^{10}	8692.99	74398.33
% 5	42881.86	q^{10}	8437.08	61413.18

4.3.4. Determination of tree values in walnut orchards

As stated in the previous chapters, 6 x 6 and 10 x 10 planting ranges are generally used in the orchards in the scope of the research area. Therefore there are 14,91 trees per decare on average. On the other hand, most of the trees are 6 and 10 years old in the research area.

K_0, $K_{.6}$, and K_{10} values were substituted in formulas and tree values were calculated as in Table 12. As can be seen in Table 12, the value of trees at the 6th age was higher than the 10th age.

Table 8: 6 and 10 year old values in walnut lands

Capitalization Interest Rate (f)	K_6 (TL/da)	Bare Land Value K_0) (TL / da)	6 Year Old Tree Value (TL)
% 4	77514.79	56135.20	1433.91
% 5	65161.62	42881.86	1494.28
Capitalization Interest Rate (f)	K_{10} (TL/da)	Bare Land Value $(K_0$) (TL / da)	10 Years Old Tree Value (TL)
% 4	74399.97	56135.20	1225.00
% 5	61412.26	42881.86	1242.82

5. Conclusion

This research was carried out in order to determine the principles that can be applied to the valuation of fruit fields and to evaluate the walnut orchards in Silivri district of İstanbul. In the study, the values of walnut orchards were determined according to income methods. Bare land value, tree value and tree values are calculated in walnut lands with income method. In the determination of wooded value, historical values methods were used.

The valuation studies are carried out mostly for the purpose of expropriation and it is necessary to determine the values of the lands to be expropriated according to the law according to the income method. It is important to determine the appropriate capitalization rate for the region in order to make an accurate valuation by income method. However, since the rate of capitalization may vary into different regions or different lands, the determination of this ratio for each region with the scientific studies to be made will make significant contributions.

If the data can be found in the valuation of the yielded fruit orchards, market values should be taken as a basis, based on similar sales. However, it is not always possible to do so. Agricultural lands are not sold in rural regions every time. However, if the market value cannot be found or if the legislation is envisaged, the income method should be used.

The net income should be calculated correctly in the valuation of fruit orchards according to the income method. However, there are some problems in obtaining the necessary and correct data due to not keeping the records properly in the agricultural enterprises in the research area. Therefore, it should be tried to encourage consciously registering in agricultural enterprises and training should be given.

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