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Review

Total economic value of forest resources in Turkey

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Forests, like some other natural resources, perform a set of functions to meet the needs of people. It is usually impossible to state the monetary value of all the goods and services provided by forest resources. As a research area, this topic is gaining importance rapidly in Turkey as well as in other developing countries. In this study, the contribution of direct and indirect use values, option values, existence values and negative externalities to the Total Economic Value (TEV) were accounted. The most important share of Turkish forestry in its TEV was represented by the direct use values including wood and non-wood forest products. The option and existence values remained somewhat vague and difficult to calculate. In this study, the TEV concept was reviewed for Turkish forestry, and then the TEV components of forest resources were presented and discussed. From the calculations undertaken for each TEV component, it turned out that the positive TEV component of Turkish forests was about US$ 1 704 810 889,48. This figure should be considered as a minimum estimate due to the fact that the values of many externalities assumed lower bounds being based on conservative assumptions

Key words: Total economic value, Turkish forests, forest goods and services.

INTRODUCTION

Forests are renewable and complex ecosystems capable of providing a wide range of environmental, economic, social and cultural benefits. Turkey has about 21,2 million ha forest areas (State Planning Organization, 2007) producing various goods and services, which contribute directly to the well being of people and are vital to the economy and the environmental conditions of the country. While essential roles of forests are increasingly recognized by the Turkish society as a whole, their benefits and functions are differently valued amongst people and society segments. Moreover, such valuation continues to modify over time, due to changing needs and expectations of society (Dogru, 2001). The values associated with conventional forest products, such as lumber and pulp and paper, pass directly through markets. On the other hand, many benefits that are derived from forests do not pass through markets, such as hunting, fishing, or bird watching, or the value of the role that forests play in regulating weather patterns. Therefore, it is becoming increasingly important to identify and evaluate these non-market benefits due to the increased pressure on the natural resources, the increased demand for non-market resources, and society's strong desire to preserve the natural heritage for future generations (Condon, 1998). It is usually impossible to state the monetary value of all goods and services provided by forest resources. However, some serious attempts to put value on the non-market goods and services of environmental resources such as forests have been recognized in the developed and developing countries in the world (Willis and Benson, 1988; Hanley, 1989; Marinelli et al., 1990; Hanley and Ruffell, 1992; Adamowicz, 1995; Scarpa et al., 2000; Damigos and Kaliampakos, 2001; Merlo and Croitoru, 2005). The wide range of benefits that forests provide creates a challenge for analysis. A coherent analytical framework is needed to ensure that these benefits are considered systemati-cally and comprehensively, but with-out double counting. The total economic value (TEV) has been used in recent years to identify and, to a certain extent, quantify the full value of the different components of natural resources such as forests (Merlo and Croitoru, 2005). The topic as a research area is getting importance rapidly in Turkey as well as in other countries. In this paper, the coverage of the TEV concept, its components including sub-items was briefly reviewed theoretically. Later, the concept was evaluated from the goods and services provided by forest resources, and lastly, the TEV

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of Turkish forests was estimated and discussed from the forest management point of view.

FRAMEWORK OF TOTAL ECONOMIC VALUE APPROACH

The economic concept of value has been broadly defined as any net change in the welfare of society. This concept does not restrict environmental values to benefits from the direct use of a resource. For example, the benefits received from environmental resources (such as enjoyment of national parks and clean air) add to an individual's well-being, as do the benefits obtained from the consumption of goods (such as steel and sawn timber). The benefits that individuals obtain in satisfying altruistic desires that arise from their own moral beliefs also have economic value. From an economic perspective, values can be associated equally with the consumption of goods and services purchased in markets and with the services from environmental amenities for which no payments are made. In this sense, anything from which an individual gains satisfaction is deemed to be of value, so long as the individual is willing to give up scarce resources for it (Anonymous, 1996). A total of the values including direct, indirect, option, and existence values of the natural resources is defined as the TEV concept. There are no definite and rigid rules about the components of TEV and therefore, many different approaches have been discussed about this concept. Generally, the items forming the TEV are classified into main and sub-components.

After definition mentioned above, it is understood that the TEV concept is sum of the values, which a natural resource will be able to have. This concept was popularized by David Pearce (Perman et al., 1995). As the TEV concept is a sum of values, there are some components of the sum. These components can be explained as under following sub-headings. The components forming the TEV can be variously divided into main and sub-groups. One of them and widely accepted is the classification shown in Figure 1. According to this classification, the TEV can be divided into two main components as use and non-use values (Perman et al., 1995; Adamowicz, 1995). Some economists accept the option value as third main component in addition to former two main components (Merlo and Briales, 2000). In this paper, the classification formed as use and non-use values was taken into consideration.

Use values

The benefit obtained by individual by directly using the natural resource is defined as use value. The values as sociated to the outdoors recreation are use values, which are given as example (Adamowicz, 1995) . In this case, it is seen that the use values from the main components of TEV are arisen from the physically use of environmental resources such as visiting a national park and recreational fishing. Use benefits also comprise benefits unaccompanied by market exchanges or explicit activities. For example, people may derive use benefit simply from experiencing a place without directly participating in any explicit activities (Anonymous, 1996). In this case, the use values are also divided into three sub-components as direct, indirect and option values.

Direct use values

The most important component of use values is direct use values. These values result from current use of the resource, including consumptive uses such as hunting and fishing, nonconsumptive uses such as hiking, camping, boating and nature photography (Fausold and Lilieholm, 1996).

From the forestry perspective, the economic value of wood based forest products such as timber and fuel-wood, non-wood forest products such as cork, resin, mushrooms, decorative plants, and medicine plants and other services such as hunting, grazing recreation (Merlo and Briales, 2000), biodiversity and economic security (Perman et al., 1995) are accepted under the direct use values.

Indirect use values

Indirect use values are the benefits indirectly obtained by using the environmental resources. For example, indirect uses of environmental resources such as reading books related to the natural resource or watching television programmes about wildlife (Fausold and Lilieholm, 1996). These are indirect use values for the people, but the direct use values for the producers.

Soil conservation, avalanche prevention, flood prevention, balancing microclimate, landscape quality, water quality and purification, biodiversity, conservation of the local ecosystem functions of forest resources are considered under this category (Merlo and Briales, 2000).

Option values

There are a number of different interpretations of this concept, which was founded by Weisbroad in 1964 and this concept relates to the preservation of unique natural assets. The option value is estimated for a resource that will be possibly spoiled at any time in the future. The value of benefit obtained by individuals from that resource is option value of natural resource in question (Kula, 1994). The values of being personal future recreation and environmental interests, potential

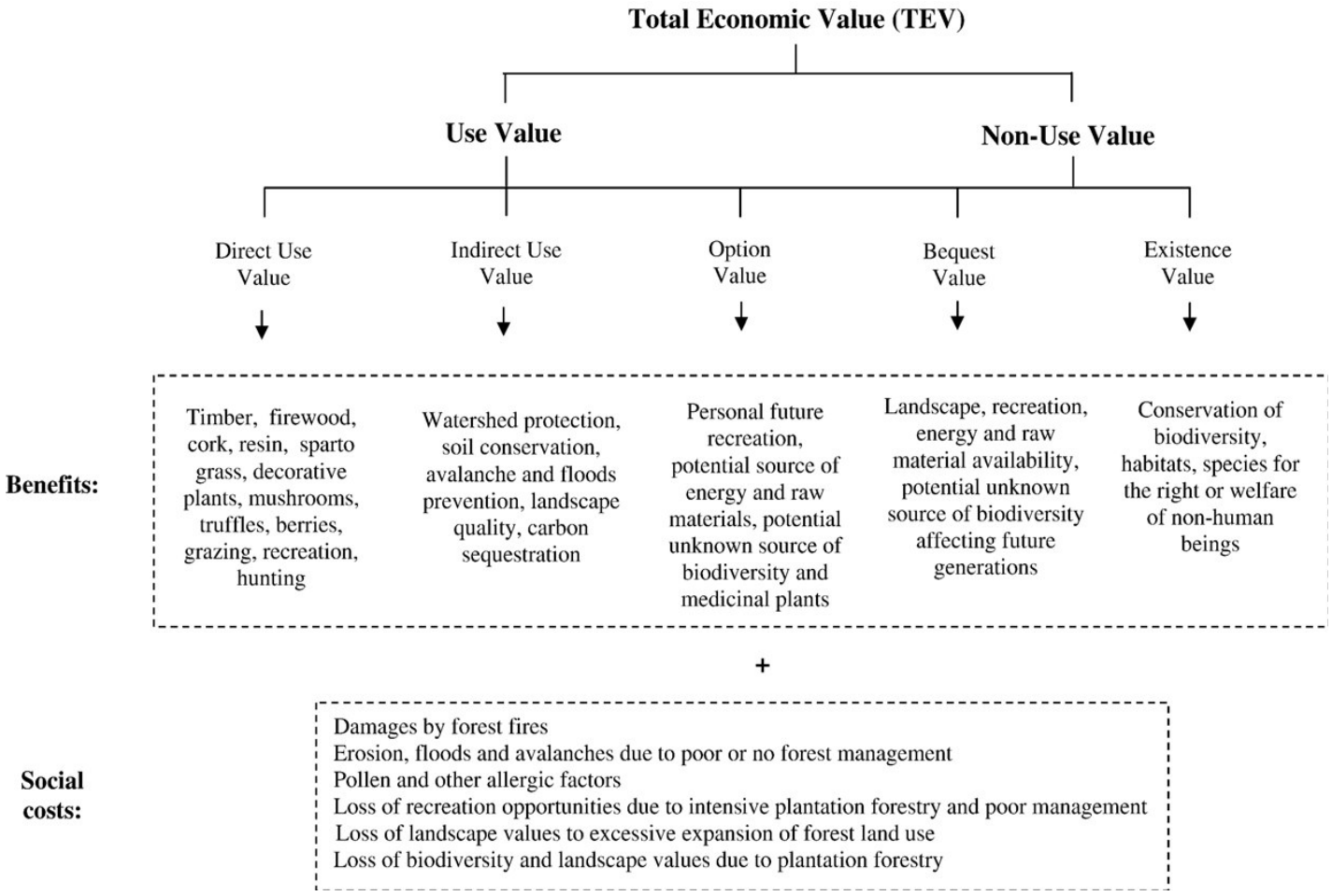

Figure 1. The components of total economic value (Croitoru, 2007).

source of energy and raw materials, potential unknown source of biodiversity, medicine and plants etc., potential use of unused landscape resources of forest resources are con-sidered under this category (Merlo and Briales, 2000).

Non - use values

Non-use values are emphasized as the values estimated for the natural resources although they are not used in fact. In this scope, the non-use values are divided into two categories as existence and bequest values.

Existence values

Existence value is that placed on a natural resource amenity, even though individuals may never use or visit it; however, it is important for them to know that the amenity will continue to exist (Condon and Adamowicz, 1998; Klemperer, 1996). As seen, existence value is arisen from the willingness to pay for the assurance of getting benefit from the satisfaction because of con-sumption or being existing of the natural resource.

The functions of forest resources such as biodiversity, landscape (Merlo and Briales, 2000; Perman et al., 1995), environmental conditions e.g. related to carbon storage, affecting other species, respect for the right or welfare of non-human beings including the forest ecos-ystem (Merlo and Briales, 2000) are considered under this category.

Bequest values

Bequest value is defined as the willingness to pay to pre-serve some resource for future generation (Klemperer, 1996). The concept produces a willingness to pay at present point in time in order to ensure that certain values are maintained and made available to future individuals. If these individuals are immediate descendants then the respondents would be fairly confident at guessing the nature of the beneficiaries' preferences. However, it

would not be too difficult to make reasonably accurate guesses about the preferences of distant generations on the basic issues such as clean air, clean water, maintenance of natural wonders, soil fertility, etc. (Kula, 1994). In the bequest value context of forest resource, landscape, recreation, energy and raw material availability, biodiversity, environmental conditions e.g. related to carbon storage, affecting future generations may be considered (Merlo and Briales, 2000).

Social costs

All benefits mantioned above have positive value and can be easily located within the TEV categories. Other outputs, such as erosion and floods due to poor forest management, are social costs and as such, have negative value. Some of them can be easily attributed to the different value categories. For example, erosion, floods and avalanches due to poor forest management mostly affect the indirect use values of forests. Others, such as damages due to fires, are more difficult to separate, as they affect several categories of value. Because of this, Figure 1 presents the social costs linked to forests without dividing them among the TEV categories (Croitoru, 2007).

VALUATION METHODS OF THE TEV COMPONENTS

The study uses a wide variety of methods and approaches to estimate the forest benefits in Turkey. This section briefly summarizes the valuation techniques used in this research.

Use values

As mentioned above section, the use values are also divided into three sub-components as direct, indirect and option values. In order to put economic value on these three sub-components, differet methods have been developed and used in the all over the world.

Direct use value

Direct use values are usually easiest to estimate. The major direct uses of forest resources are: wood based forest products (WFPs), including timber and firewood; non-wood forest products (NWFPs), such as Thyme leaves, Cone of semen pine, Sweet gum oil and mushrooms; grazing; and recreation and hunting. The value of the current harvest of WFPs and NWFPs is usually estimated by using market prices or by suitably adjusted shadow prices when market prices are distorted (Croitoru, 2007). The direct use values have been separated in four categories for a better identification and quantification:

- Outputs valued on the basis of market price and as such reported by official statistics and evaluated accordingly, e.g. timber, firewood and non-wood forest goods. In this study, the value of wood based forest products such as industrial woods (Log, Telephone pole, Mine pole, Industrial wood, Pulp wood, Fiber-particle wood and Sapling) and firewood and non-wood forest product (Thyme leaves, Cone of semen pine, Sweet gum oil, Laurel leaves and Resinous wood) were calculated.
- Outputs valued on the basis of imputed price, not tradable as such, but only when transformed in other output, e.g. grazing. The value of grazing is estimated on the basis of substitute goods (hay) and their average price on the market. According to Bann and Clemens (2001), forestland fodder represents a large and valuable free input to the economic life of forest communities in Turkey.
-Outputs valued on the basis of price of permits sold by Public Authorities e.g. to hunters and pickers, when clear allocation of property rights occurs. Hunting is estimated by summing the revenue obtained from the issues of hunting permits and licenses. A hunting permit from the Ministry of Environment and Forestry is required to hunt in forest areas. Hunting permits are issued for the hunting of bear, ibex, wild goat and wild boar. Recreation is estimated by means of the revenue derived from the entrance fees paid by visitors for facilities on the forest recreational site. Outputs valued on the basis of Consumer Surplus, enjoyed by people without paying a price.

Indirect use values

Carbon sequestration is the only indirect use value that could be estimated at a national level (Türker et al., 2005). The calculation is based on the annual increment minus annual felling. More explanation about the method used for carbon balance of woody biomass on forest and other wooded land can be found at chapter 3, page 155 -171 of the source (UNE-ECE/FAO, 2000). The value of carbon storage is estimated by using following equation;

$$ACS = [NAI - AF] + AFNL \quad [1]$$

Where,
ACS: The amount of Carbon stored
NAI: Net annual increment
AF: Annual fellings
AFNL: Annual fellings of natural losses.

Option values

The option value is estimated only for pharmaceuticals derived from genetic pools linked to forests in Turkey. Valuation is based on the following sample model which takes into account: the number of forest species yielding medicinal product; the royalty rate on the sales of such a product which would be payable to Turkey; a coefficient of rent capture; the likely value of internationally traded pharmaceutical product; and forest area. Herein the term “option value” is used interchangeably with Pearce’s “quasi-option value”- the former refers to the value of the option to use goods whose value is certain and has been determined by a market, the latter to goods whose value must be estimated (Bann and Clemens, 2001).

$$V_p = \frac{N \times p \times r \times a \times \left(\frac{V}{n}\right)}{H} \quad [2]$$

Where:
V_p : the pharmaceutical value of 1 ha of forest (US$/ha/yr)
N : the number of plant species in the forest
p : the probability of a hit
r : the royalty rate
a : the appropriation rate, or rent capture
V/n : the average value of drugs developed (US$/year)
H : the area of forest (ha)

Non-use values

Bequest - existence values

The bequest - existence value of biodiversity is valued on the basis of willingness to pay by international organizations for biodiversity conservation (Türker et al., 2005). Existence values are based on the pure knowledge of a resource's continued existence and are unrelated to use. The total is a one-off payment of almost US$ 14 million, or US$ 0.70 per forest hectare. Annualised at a discount rate of 10%, a one-off payment of US$ 14 million is financially equivalent to a perpetual recurring payment of US$ 1 380 000 per year (Bann and Clemens, 2001). This should be regarded a minimum estimate of biodiversity conservation value as: (i) the overall sum (US$14 million) refers only the protected forest area, which is much less than the total forest; and (ii) the willingness to pay itself by international organizations represents a conservative measure of estimating biodiversity conservation (Türker et al., 2005).

Social costs as a negative TEV components

In this category, the erosion due to poor management and the damage caused by forest fires are estimated at national level by means of the replacement cost method. The replacement cost approach was employed to estimate the value of soil protection. As a rough replacement of soil nutrients vanished as a result of erosion, the erosion costs was estimated with amount of the fertilizers needed for replacement (Bann and Clemens, 2001). The replacement cost, of course, is not equal to real damage values, since this approach only considers the vanishing nutrients and the exact amount of nutrient loss is not really known. Thus, this cost estimation is very minimal compared with the real losses, because: (i) assumption of 5% of erosion is attributed to the forestry is very beyond the range of real share considering that half of the forests degraded; (ii) irreversible losses of soil is not taken into account with this assessment.

In Turkey, the damage provoked by forest fires is valued by summing three items: (i) the market value of timber lost in forest fires; (ii) increased afforestation costs because of the forest fires, and (iii) extinguishing costs. With an economists view, there are more items to include this estimation of forest fire damage such as (i) the value of damages on non-wood forest products which are more sensitive to fire; (ii) the value of endemic species destroyed completely; (iii) opportunity cost of labor used in forest fire suppression; (iv) devoid of land revenue due to fire; (v) extra administration costs for burnt out forests etc (Türker, 2008; Türker et al., 2001).

RESULTS

The results obtained from the study are presented under each main and sub-component of TEV.

Use values of forest resources

Direct use values

In this section, the results were reported for the wood based and non - wood forest products, grazing, hunting and recreational values.

Wood based forest products: Table 1 shows the value of timber and firewood for sale, estimated according to the roadside prices, as reported by the official statistics of the Ministry of Environment and Forestry (General Directorate of Forests, 2007; State Planning Organization, 2007). In addition, illegally harvested firewood represents roughly more than half of Turkey's annual firewood production and passes through no market whatsoever. Even though it is a result of illicit activity, it represents a use value by meeting the fuel needs of many low-income forest villagers depending on forests (Türker et al., 2005).

Non-wood forest products: The value of non-wood forest products including Thyme leaves, Cone of semen pine, Sweet gum oil, Laurel leaves and Resinous wood were calculated according to the quantities traded on the market and their average prices for 2006 reported by the official statistics of the Ministry of Environment and Forestry (General Directorate of Forests, 2007) and presented in Table 2.

Grazing: According to the State Planning Organization (2001) the number of animals existing in forest villages and considered to be generally grazed in forest areas are: 5,6 million cattle, 10,7 million sheep, 11,8 million goats, and 1,6 million horses. While grazing patterns vary significantly between regions, animals commonly graze freely in the forest for 8 months of the year (roughly April to November).

Quantitative and monetary indicators for grazing: The total value of grazing has been estimated using following indicators at national level:

- 2,3 million tons of fodders are obtained annually from forest pastures.
- According to the Ministry of Environment and Forestry, the market price of 1 kg fodder cut from meadows is around TL 0,35 (US$0,23).

Monetary valuation for grazing: Conservatively assuming that the value of forest pasture is lower than this, that is TL 0,15/kg, (US$0,098) forest fodder can be valued at around US$225 million annually (2 300 000 000 x 0,098).

Hunting: Average revenue from hunting per session is around US $ 15 800 000. Hunting is estimated by summing the revenue obtained from the issue of hunting permits and licenses. A hunting permit from the Ministry of Environment and Forestry is required to hunt in forest areas. Hunting permits have been issued for the hunting of bear, ibex, wild goat and wild boar. Income from hunting permits was around US$200000 annually. Annual revenue obtained from hunting licenses per session is around US $ 15 600 000. Freshwater fishing is under

Table 1. Value of wood based forest products.

Products	Unit	Quantity	Price (US$/m^3)	Total (US$)
Log	m^3	3.479.657	127,97	445278141,53
Telephone pole	m^3	73.273	176,27	12915918,64
Mine pole	m^3	490.619	105,08	51556572,88
Industrial wood	m^3	749.951	93,22	69910686,44
Pulp wood	m^3	1.514.472	68,64	103959518,64
Fiber-particle wood	m^3	2.964.647	44,92	133157873,73
Sapling	m^3	26.087	77,12	2011794,07
Total industrial wood	m^3	9.298.696		818790505,93
Fuel wood	Ster	7.003.598	30,51	213669091,53
Firewood illegally harvested	Ster	4.350.000	30,51	132718500,00
Total				1 165 178 097,46

Table 2. Value of non-wood based forest products.

Products	Unit	Quantity (Kg)	Price (US$/Kg)	Total (US$)
Thyme leaves	Kg	892 392	0,02	15 125,29
Cone of semen pine	Kg	3 545 861	0,08	300 496,69
Sweet gum oil	Kg	127	2,55	323,96
Laurel leaves	Kg	7746311	0,02	131 293,41
Resinous wood	Kg	832215	0,01	7 052,67
Total				454 292,02

taken in 69 lakes and ponds in the forest areas. Freshwater fish production is around 37 500 tons per season, and based on the market prices of captured species may be valued at around US$79 million (State Planning Organization, 1996). It is accepted that only one-quarter (US$20 million) of this revenue was obtained from the forest areas.

There are government - managed fish production and breeding stations, with a capacity ranging from 50000 to 2 million fish per station in forest areas. According to the General Directorate of Nature Protection and National Parks, gross income from fish sales at just six of these stations totaled over US$147000. Moreover, 700 anglers visited Yedigoller National Park, generating US$1500 in revenue. The aggregate value obtained from these estimates, however, only partially reflects the true value of this activity, due to unavailability of data at a national level. As a result, total annual income from hunting is about US$ 35948500 (Table 3).

Recreation: Sites and facilities established within forest areas meet an important part of the demand for recreation in Turkey. There are 316 forest recreation sites covering 11034 ha in Turkey (Ministry of Environment and Forestry, 2007). These recreation sites are annually visited by about 7 million people. The average entrance fee is about US$0.85 per person per entrance. According to these date, annual revenue from recreation is about US$5.950.000 (Table 3).

Indirect use values

The value of carbon storage is estimated by using Equation [1] and the following information. Accordingly, the amount of carbon annually sequestered by forests is estimated at 7.92 MtC. The economic value is derived by applying a shadow price of US$20/tC (Fankhauser, 1995). This figure can be multiplied for an imputed price of 20$ per to making up a total of 158.4 million $.

Option values

The option value of pharmaceuticals were estimated by using Equation [2]. Based on best guess factors for Turkey, estimates of the potential value of pharmaceuticals based on three scenarios are given in Table 4. The present valuation adopts the medium scenario reporting an option value of US$6.3 /ha; based on this,

Table 3. Value of hunting and recreation.

Type of output	Quantity and other related indicators	Estimated monetary value and/or other related indicators US$	Total estimated value US$
Hunting	Hunting (including licences, permits)	15 800 000	
	Fishing (including trout breeding and sport fishing)	20 148 500	
Total hunting value			35 948 500
Recreation			5 950 000
Total			41 898 500

*C. Bann and M. Clemens, Turkey forest sector review-global environmental overlays program final report, (April 1998), İksir Tanıtım Ltd. Şti., 2001 (in Turkish).

the total value is US$112.5 million.

Non-use values of forest resources

Bequest - existence values

Existence values are based on the pure knowledge of a resource's continued existence and are unrelated to use. The total is a one-off payment of almost US$ 14 million, or US$ 0.70 per forest hectare. Annualised at a discount rate of 10%, a one-off payment of US$ 14 million is financially equivalent to a perpetual recurring payment of US$ 1 380 000 per year (Bann and Clemens, 2001). This should be regarded as a minimum estimate of biodiversity conservation value as: (i) the overall sum (US$14 million) refers only th the protected forest area, which is much less than the total forest; and (ii) the willingness to pay itself by international organizations represents a conservative measure of estimating biodiversity conservation (Türker et al., 2005).

Social costs as a negative TEV components of forest resources

Erosion: There are various estimates of soil loss in Turkey ranging from 500 million to 1 billion t. The least loss estimate means the vanishing of 2.2 Mt of plant nutrients supposing that the soil contains on average 0.1% N, 0.15% P_2O_4 and 0.154% K_2O. The market prices of fertilizers vary from US$0.45 to US$2/kg. If a price of US$1.25/kg is chosen within this price range to assess the replacement costs for erosion, the substituent fertilizers' charge would be US$2.75 billion. This amount can not be directed to the forest degradation or deforestation due to the lack of data or information on the actual share of forestry sector in contributing erosion as a result of poor forest management. Nonetheless, assuming the poor forest management induces the just 5% of the total erosion in Turkey, once more in a conservative manner, replacement costs still would be over US$125 million annually.

Forest fire: In Turkey, an average forest area of 5804 ha is under direct effect of forest fires annually in accord with General Directorate of Forests (GDF) statistics. The value of the forest fire damages was calculated by summing three items: (i) the market value of timber lost in forest fires (US$2.2 million); (ii) increased afforestation costs bec-ause of the forest fires (US$4.5 million), and (iii) extin-guishing costs (US$1.8 million).

Towards the total economic value of Turkish forests

Forest outputs, including public goods and externalities, were identified according to the TEV framework and estimated on the basis of wide range of valuation methods. The results, reported in Table 5, are national level estimates of annual flows, except for recreation and angling which are local level results. The table shows the results of the monetary valuations in US$ for 2006. According to Table 5, and with the limitations, the contributions of direct and indirect use values, option values, existence values to the positive TEV components of Turkish forests are 84.03, 9,29, 6.60 and 0.08% respectively.

In this case, the biggest share in the positive TEV components of Turkish forest resources is direct use values including WFPs, NWFPs, grazing, hunting and recreation and the second one is indirect use values (carbon storage). The option and existence values constitute only 6.60% of TEV. This is due to the fact that not all components of these values have been properly calculated. Table 5 shows that direct use values represent 84.03% of the positive TEV components, from which most distinguished components are WFPs (68.35%), traditional NWFPs (0.03%), grazing (13.20%), hunting (2.11%) and recreation (0.35%). Carbon storage, as an important indirect use value, is about 9.03% of the positive TEV. The share of option value in the positive TEV components (pharmaceuticals) is 6.60%, while existence values constitute only 0.08% from the positive TEV components. On the other hand, the shares of erosion and forest fires in the negative TEV components, which are the negative externalities of Turkish forest

Table 4. Potential value of pharmaceuticals based on three scenarios.

	Values (US$)		
Scenario	**Unitvalue (US$/ha/year)**	**Total value (million US$)**	**Assumptions**
Low	0.05	0.9	Appropriation rate:0.1;drug value= US$0.39 million
Medium	6.30	112.5	Appropriation rate:0.5;drug value= US$1million
High	87.0	1575.0	Appropriation rate:1.0;drug value= US$7 million
General assumptions: n=9000; probability of a hit=0.0005[a]; royalty rate: 0.05; H = 17.8 Mha.			

[a] A hit rate of 0.0005 has been estimated for tropical forest ecosystems and is applied here on the assumption that Turkey's biodiversity is comparable in richness. (Source: Bann and Clemens (2001)).

Table 5. Forest values by TEV categories.

TEV components	Type of outputs	Value (US $) per year	(%)	
Direct use values	Wood based forest products	1165178097.46	68.35	84.03
	Non-wood forest products	454292.02	0.03	
	Grazing	225000000.00	13.20	
	Hunting	35948500.00	2.11	
	Recreation	5950000.00	0.35	
Indirect use values	Carbon storage	158400000.00	9.29	
Option value	Pharmaceuticals	112500000.00	6.60	
Non use values	Existence value (to conserve biodiversity)	1380000.00	0.08	
Positive TEV components		1704810889.48	100.00	
Negative externalities	Erosion	-125 000 000.00	93.56	
	Risk of damage by forest fires	-8 607 537.00	6.44	
Negative TEV components		-133 607 537.00	100.00	
Net total economıc value of Turkısh forests		1 620 459 352.58		

resources, are 93.56 and 6.44%, respectively. In this case, the biggest share in the negative TEV components of Turkish forest resources is erosion and the second one is forest fires.

DISCUSSION

From the calculations undertaken for each TEV component, it turns out that the positive TEV component of Turkish forests is around US$ 1704810889,48 (Table 5). This figure should be considered as a minimum estimate due to the fact that the values of many externalities assumed lower bounds being based on conservative assumptions (Bann and Clemens, 2001). In addition, other public goods and services supplied by forests such as watershed management, soil conservation, avalanche prevention, water quality and purification, landscape and therapy were calculated at only local level and not included. It results that the share of WFPs in the positive TEV components of Turkish forest resources reach 68.35%, and this reinforce the previous idea of the wood based forest management approach. In other words, the values of positive externalities provided by the forest resources such as grazing, carbon storage and pharmaceuticals, which have a 29,09% impact on the positive TEV components, have not adequately been known by the forest managers, policy makers and strategists as well as rural people benefiting of most WFPs and partly NWFPs from forests.

In Turkish forestry, the estimated value of the negative externalities is about US$ 133607537,00 and this figure reduces the TEV from US$ 1704810889,48 to US$ 1620459352,58. The reducing impact proportion of the negative externalities calculated at the minimum level on the TEV is about 7.84%.

The share of forestry sector, which is among the main production sectors in the national economy and accounts for only 0.5% (Çakýi, 1984; Türker, 1999) this rate arises mainly from WFPs, partly from NWFPs and very little from hunting and recreation. On the other hand, these items (WFPs with 68.35%, NWFPs with 0.03%, hunting

with 2.11% and recreation with 0.35%), which are totally reflected into national balance sheets, make up for 70.84% of total TEV of forestry sector. On the other hand, 29.09% of the TEV are not reflected into the national balance sheets and are represented by: grazing (13.20%), carbon storage (9.29%), and pharmaceuticals (6.60%). This confirms the fact that the share of forestry sector in the national economy is lower than its real proportion.

In conclusion, the following issues can be stated regarding this issue that is aiming to determine the externalities and its TEV in forestry; Firstly, it will be exposed the real share of forests as an important natural resource, in the national economy; Secondly, more monetary support needed for investments regarding the improvement of forest resource will be allocated to forestry sector; Lastly, a good strategy and policy regarding the effectiveness of forest resources will be determined from the sustainable development point of view.

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