Economic valuation of goods and services of Tunisian forests
Preface

The valuation of goods and services of forest ecosystems and biodiversity and the integration of their value in policy making are among the main recommendations made for policy makers in MENA regional conference on the Economics of Ecosystems and Biodiversity held in Tunis on 28-29 June 2011.

In this context, the present evaluation was conducted to improve knowledge on goods and services provided by Tunisian forest ecosystems as well as their contribution to national economy and to disseminate information to policy makers and stakeholders in order to develop appropriate strategic orientations and adapted financing mechanisms.
Introduction

Forest ecosystems provide a wide array of goods and services that fulfill the daily human needs. If these ecosystems have a value to humans, they remain however priceless. The question is how to justify the large investments needed in order to protect these ecosystems?

The application of economic methods to assess the value of goods and services provided by forest ecosystems can compare the costs and benefits of actions aiming to improve them and thus provide further insight to decision makers for better conservation.

I. context

This study was conducted between January 2011 and June 2012 in partnership between the National Forest Programme (NFP) and FAO, under the supervision of the Department of Forestry (DGF). The work was led by the Society of Natural Sciences of Tunisia (SNST) which mobilized five experts from various disciplines.

II. Objectives

The study aimed at the following main objectives:

1. Identification of appropriate methods that can be applied for an objective evaluation of goods and services provided by forest ecosystems,
2. Estimation of the economic value of goods and services generated by Tunisian forests and the externalities caused by the degradation of the ecosystem based on in situ local studies,
3. Identification of innovative solutions to support politics to take best decisions for sustainable forest ecosystem management and funding of the forestry sector.

III. Methodological approach

The estimation of forest benefits was conducted in three stages. The first step concerned the identification of forest benefits based on the concept of Total Economic Value (TEV). This approach allows to include the value of non market benefits provided by ecosystem functions as an indirect use value, in addition to the values linked to profits generated by market trading resources.
Forest ecosystems can include various benefits, among which we mention the following benefits and costs:

- Contribution to erosion reduction
- Impacts on water resources
- Impacts on water quality
- Carbon sequestration
- Contribution to biodiversity conservation
- Degradation due to human pressures
- Degradation due to fire risk

The second step permitted the identification, among a wide array of methods and techniques for estimating the components of TEV of an ecosystem, those considered to be the most reliable and applicable within short time period for the economic valuation of goods and services of Tunisian forests.

The third step dealt with defining a suitable framework for the study through the selection of representative forest ecosystems sites. This choice was based on 3 main criteria: bioclimatic representativeness, diversity of goods and services provided by the ecosystem and the availability of necessary data which determined the specific methods to be used for this economic valuation.

The two sites chosen were the watershed of Barbra located in the North and the watershed of Siliana located in the Center of the country. The main selection criteria are: the diversity of goods and services provided and the availability of data for carrying economic valuation.

![Image](importance_of_livestock_in_economy_of_forest_areas.png)

![Image](economic_valuation_methods_of_goods_and_services.png)
### Barbra watershed

The watershed of Barbra covers a surface area of about 16,400 ha (DGF, 2010). The main land uses are distributed as follows:

- Forests: 4,300 ha
- Shrubs: 700 ha
- Rainfed agriculture: 6,400 ha
- Agroforestry areas: 2,000 ha
- Forest plantations (2000-2010): 800 ha

### Siliana watershed

The watershed of Siliana covers a surface area of about 91,000 ha (DGF, 2010). The main land uses are distributed as follows:

- Forests: 12,350 ha
- Shrubs: 10,600 ha
- Rainfed agriculture: 46,000 ha
- Heterogeneous agricultural areas: 14,000 ha

### Valuation methods

Source: adapted from Merlo and Croitoru (2005)

V. Valuation methods used in this study

For both sites, the economic valuation has been conducted using different methods. A summary of these techniques is given in the preceding table:

<table>
<thead>
<tr>
<th>Direct use values</th>
<th>Physical indicators</th>
<th>Monetary indicators</th>
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<td>Market price</td>
<td>Quantity (m³)</td>
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<tr>
<td>Collected wood</td>
<td>Market price</td>
<td>Market price of substitute goods</td>
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<td>NWFP</td>
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<td>Market price of substitute goods</td>
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<td>Forage</td>
<td>Market price</td>
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<tr>
<td>Hunting</td>
<td>Market price</td>
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<td>Recreation</td>
<td>Method of value transfer</td>
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<tr>
<th>Indirect use values</th>
<th>Physical indicators</th>
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<tr>
<td>Watershed protection</td>
<td>Method of production function</td>
<td>Quantity of sediments avoided in dams</td>
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<tr>
<td>Carbon sequestration</td>
<td>Market price</td>
<td>Net change in carbon sequestration in biomass and soil</td>
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<tr>
<th>Option, existence and bequest values</th>
<th>Physical indicators</th>
<th>Monetary indicators</th>
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<tbody>
<tr>
<td>Biodiversity conservation</td>
<td>Cost-based approach</td>
<td>Surface area protected (ha)</td>
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<th>Negative values related to the use and forest management</th>
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<td>Degradation related to fires and deforestation</td>
<td>Damaged costs</td>
<td>Burned area (ha)</td>
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<tr>
<td>Agricultural damages related to forest wildlife</td>
<td>Replacement cost</td>
<td>Affected area (ha)</td>
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</tbody>
</table>
VI. Estimation of the total economic value (TEV)

For each site, the total economic value was estimated by summing the values of all goods and services. This value is then distributed according to the type of beneficiary: the state (budget), the local population, the Tunisian society and the international community.

In order to get an estimation of the TEV of all Tunisian forests, all goods and services were identified, and the quantities produced and their values were also determined. For forest services, such as soil and water conservation, the specific sites chosen do not allow extrapolations of results of this study to all Tunisian forests. However, certain values of forest services of Barbra site could be extrapolated with caution to the forests of the three northern governorates, while some values from Siliana could be extrapolated to the forests located in the center of the country. It should be noted that some values are found within one site, and not in the other, such as recreation and hunting.

VII. TEV - Barbra Watershed

The benefits value is estimated at 1.89 million DT corresponding an average of 328 DT/ha of forests in 2010. However, the value of degradation costs is estimated at 25 DT/ha. This means a total economic value estimated at 1.75 million DT or 303 DT/ha.

Beneficiaries are: Local population (48%), State (25%), Tunisian society (13%) and the international community (14%).

The average benefit per household depends on the user population; it range between 163 and 493 DT/household (1 to 1/3 of the rural population). Forage and cork together represent 61% of the total economic value. Generally, the watershed protection is the third benefit in terms of importance, but this value becomes substantially greater in forest plantations on river banks.
VIII. TEV - Siliana Watershed

The total economic value is estimated at 4.630 million DT in 2010, 197 DT/ha on average. This value is distributed between direct use benefits (68%), indirect use benefits (30%), benefits of non-use (4%), and externality costs (-3%). The forage is the main benefit (57%) of the forest in terms of economic value, followed by the protection against soil erosion (26%).

The value of goods and services, provided by forests, benefits by about 63% to the local population, 25% for Tunisian society, 4% for the state budget and 8% for the global community.

The average household income is situated between 250 and 1000 DT/year (1 to ¾ of rural population is user).
IX. TEV - Tunisian Forests

The total economic value of Tunisian forests is estimated at 204 millions DT which corresponds to 172 DT/ha. This value represents 0.3% of GDP, and 20 times the value of net benefits of forest products sold by the state. This total economic value benefits to about 61% to local population, mainly due to grazing resources, 22% to Tunisian society through soil and water conservation, 12% to international community, through carbon sequestration and biodiversity conservation and finally 5% to State, through the sale of certain products such as cork and wood in particular.

The forage represents the main benefit with 59% of the forest in terms of economic value, followed by the protection against soil erosion with 23%.

The average benefit obtained per household is 803 DT/year, for a user population of 750,000 inhabitants in 2010 (DGF). Moreover, these benefits result in significant income related to breeding activities, exploitation and processing of forest products, mainly in local level which can be greatly improved (2300 DT/household in Khorgalia, Nefza in 2010).
X. Key lessons learned

The main lessons we could learn from this study can be summarized in the following statements:

- Forage production is the main direct benefit of forests.
- The benefit of water and soil conservation can be very important especially in plantations fixing the banks of rivers for protecting downstream reservoirs.
- The current national accounting system is not suitable for economic assessment of forest ecosystems.
- The local population is the main recipient of goods and services of forests. They suffer from a loss of gain in the case of prohibition of access to resources following the creation of natural reserves or new plantations.
- The overuse of resources results in a high social cost associated with the loss of current and future productions, carbon emissions, land degradation and loss of biodiversity. In addition, the non sustainable management of wildlife evolution causes damage in the surrounding farmlands.

It is necessary therefore to:

(i) integrate non-market benefits (92%) in the strategies and management plans, (ii) optimize the production of goods and services of forests by maximizing profits and reducing costs, while taking into account the interests of different stakeholders. Forest management should adapt to the socio-economic aspects of the user population, (iii) guide the sylvopastoral development according to the specificity of the study area and the predicted impacts of climate change. Thus, each project / intervention should be the subject of a correct assessment of costs and benefits that can generate locally (forage production), at the national level (reducing erosion, conservation of water resources) and globally (carbon sequestration) in order to identify the best alternative point of view of society, (iv) develop economic incentives to improve production and conservation of forest services.

Despite the benefits for local people, the forest is often viewed by local communities as a barrier to development and not as a source of income. This fact is explained by the low household incomes, the limited resources of forests and unemployment. This situation creates conflicts between the forestry administration and local people about the use of forest resources and the creation of employment. This has emerged during the revolution through fires and violence against managers and damages caused in many national parks. Thus, the activities of management and conservation should be accompanied by a compensation systems for income loss. Projects in forest products development should be encouraged with the participation of local people.

Moreover, the production of services through the diversification of activities such as hunting, ecotourism and recreation should be developed (through concessions for example) while ensuring the improvement of benefits due to local population as well as the sustainable production of environment services.
XI. Elements for supporting decision making

The following guidelines for the decision support are designed to optimize the production of goods and services of forests:

1) The promotion of optimal management of forests,
2) The development of incomes from forest goods and services,
3) Promoting the participation of local people and cross-sector dialogue,
4) Adaptation of the national budget to ensure the sustainable provision and use of goods and services of forests,
5) Conception of financing mechanisms in order to encourage sustainable management of forest resources and reducing costs of their degradation.

XII. Guidelines for forest policy

Some goods and services are overexploited (grazing, firewood) while others are not provided in an optimal manner (recreation, protection against erosion). Public intervention may be necessary to ensure the sustainable provision of forest goods and services.

1. Promote the optimal management of forests

- Implement the approaches, methods and tools for multifunctional management of forest ecosystems for ensuring conservation and sustainable management of forest resources.
- Clarify property rights, particularly concerning the exploitation of forest resources.
- Support multiple-use management integrating all resources and their links with the population depending on forests, while ensuring the conservation of environmental services, including water resources.
- Invest in conservation of ecosystems, such as increasing resilience to climate change, reducing the risk of natural disasters (dieback, mortality, landslides, floods, fires).

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1: This topic was discussed in the regional conference organized by the GIZ in Tunis entitled: The Economics of Ecosystems and Biodiversity: Recognizing and Capturing the Value of Forest Ecosystem Services in the MENA Region (Middle East and North Africa), 28th and 29th June 2011. http://teeb-tunis.yolasite.com
2. Developing revenues from forest goods and services

There is an urgent interest to develop an effective strategy to increase the income from forest products. This is not only to create markets where they do not exist yet, but also to positively differentiate these products through the certification or assignment of a designation of origin for mushrooms, honey, etc.

- Increase the revenue value chain for NwFPs (e.g., through support for small and medium enterprises in rural areas, certifications) and support the marketing initiatives of goods and services. It should be necessary to adopt a coordinated approach to private and public actions at the sectorial level of certain products, such as cork, rosemary, etc., which are the basis of industrial activities subject to strong competition from substitute products.

- Evaluate and promote experiences on private concessions, especially ecotourism.

- Offer to the international business companies «Green Solutions» to internalize CO₂ emission reductions and biodiversity conservation.

3. Promoting the participation of local people and encouraging the cross-sector dialogue

The organization of collective action of economic agents involved in forest areas can be important in terms of sustainable management not only to internalize forest externalities (which have the characteristics of public goods), but also to develop private initiatives for marketing direct use values of forest areas (firewood, hunting, ecotourism, etc.).

- It is a requirement to develop win-win partnerships in the valuation of forest goods and services. The initiation of a dialogue between stakeholders (herding, dams, water and soil conservation, etc.) improves the efficiency and demonstrates the contribution of forests to human welfare. Furthermore, collective management should benefit to local people living in the forest.

- Improve standards of governance by supporting relevant forms of voluntary community organizations.

- Strengthen the intersectorial dialogue (herding, water, watershed protection, energy, tourism, environment).
XIII. Orientations in terms of financing the forestry sector

4. Adapting the national budget framework to insure sustainable provision and use of forest goods and services

The establishment of a transparent and participatory system for funding sustainable forest management (SFM) can insure interventions in line with national plans and priorities. This fund would provide compensation for the exclosure, subsidies for afforestation in private lands, funding for biodiversity conservation (protected area management), protection of watersheds and reduction of fire risks.

- Negotiate appropriate Environmental Fiscal Reforms (EFR) and try to promote and include instruments for SFM. New thoughts must also focus on the potential of implementing regulations (forest fund, reforestation incentives).

- Allocate spending necessary to insure forest management activities and exploitation (cork, wood industry), particularly those financially and economically profitable.

- Update prices of forest products and review the sanctions related to forest offenses.

- Reform subsidies that cause damages to the environment.

5. Developing funding mechanisms to encourage sustainable management and reducing costs of degradation

There is a need for a compromise between the immediate needs of local populations (grazing, harvest of firewood) and production of environmental services. Incentives can be applied to encourage local communities towards a more sustainable use of forest resources. Also, programs and tools well designed can lead to economically viable interventions.

- Develop compensation systems for income loss from grazing in protected areas with sustainable financing schemes.

- Learning from the implementation of innovative financing mechanisms (payment for environmental services (PES), systems of biodiversity offsets, carbon finances in other regions, and explore modalities of possible application.

- Taking advantage from the opportunities for financing offered by the Rio conventions (REDD+, CDM, Adaptation Funds, GEF, Access and Benefits Sharing (ABS), Arab Fund for the Environment, etc.) and analyze the possibility of their adaptation to the national context.

- Establish a network of pilot sites for the implementation of these mechanisms.
References


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