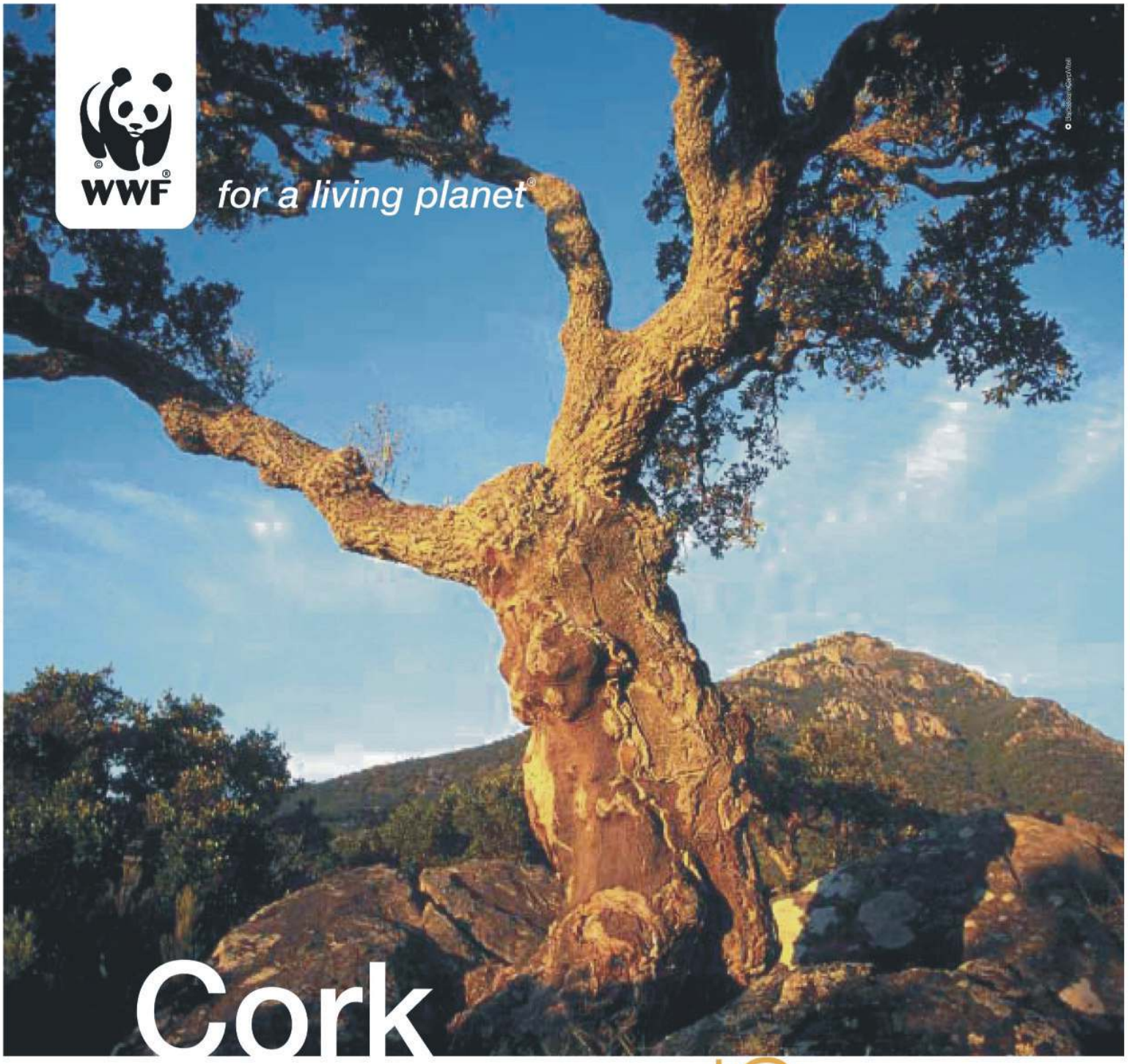

Cork screwed?

Environmental and economic impacts of the cork stoppers market

A WWF Report
May 2006

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Environmental and economic impacts of the cork stoppers market.

May 2006

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Front cover photo: Cork oak tree (*Quercus suber*), Andalucia, Spain © WWF-Canon / E. Parker

Cork screwed?

Environmental and economic impacts of the cork stoppers market

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1- INTRODUCTION

There's a whole world in a cork stopper

Cork oak landscapes cover approximately 2.7 million hectares of Portugal, Spain, Algeria, Morocco, Italy, Tunisia and France. As well as providing a vital source of income for more than 100,000 people, these landscapes also support one of the highest levels of biodiversity among forest habitats, including globally endangered species such as the Iberian Lynx, the Iberian Imperial Eagle and the Barbary Deer.

Cork is a truly sustainable product – it is renewable and biodegradable. Cork harvesting is an environmentally friendly process during which not a single tree is cut down. The bark renews itself ready for the next harvesting.

Over 15 billion cork stoppers are produced every year and sold worldwide to the wine industry. These stoppers are processed from bark harvested from cork oak woodlands that have existed in the Western Mediterranean for thousands of years.

Cork for bottle stoppers accounts for almost 70% of the total value of the cork market. The wine industry thus plays a vital role in maintaining the economic value of cork and the cork oak forests.

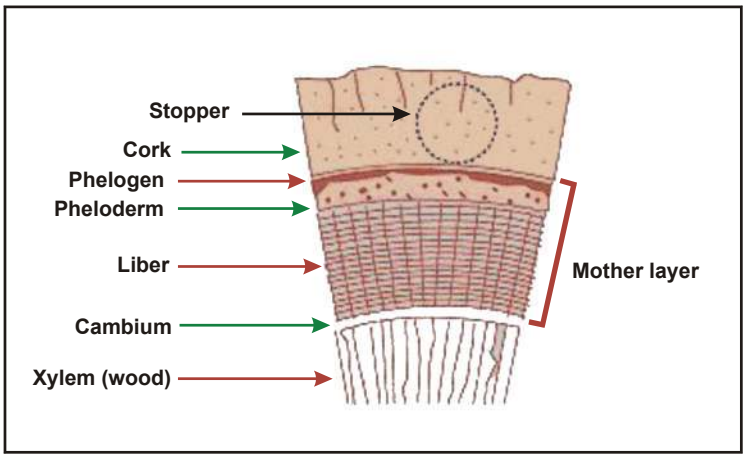
The increase in the market share of alternative wine stoppers, specifically plastic stoppers and screwtops, could reduce the economic value of cork lands therefore leading to conversion to other uses, abandonment, degradation, and finally loss of one of the best and most valuable examples of a human–nature balanced system. Because the forests have an economic value to local communities, people care for the forests. This helps maintain their environmental values as well as reducing the risk of fires and desertification.

Unless the commercial value of cork stoppers is maintained, and especially demand for cork stoppers, there is a risk that the Western Mediterranean cork oak landscapes will face an economic crisis, an increase in poverty, an intensification in forest fires, a loss of irreplaceable biodiversity and an accelerated desertification process within less than 10 years, according to the worst case scenarios.

2 - WHAT IS CORK?

Cork is formed by the phelogen (also called cork cambium) that is located in the outer bark of the cork oak. It is a one-cell layer with the capacity of cell division, that surrounds the tree stem and branches as a continuous cylindrical envelop . The phelogen forms numerous layers of cork cells to the exterior (and a few layers of another tissue, pheloderm, to the interior), each phelogen mother-cell producing a row of radially aligned cork cells.

Figure 1. Cross section of a cork oak stem, showing the different layers.



Source: http://www.preteux-bourgeois.com/uk/mise/pourq.htm

The cork may be easily stripped off from the tree, by separation at the phelogen. This is done when it is physiologically active in late spring and early summer because the cells are turgid and fragile, and tear without damage to the underlying tissues. The cork oak responds by regenerating new phelogen a few millimetres inside the phloem that quickly starts its activity of forming new layers of cork to the exterior, thus restoring this protective barrier.

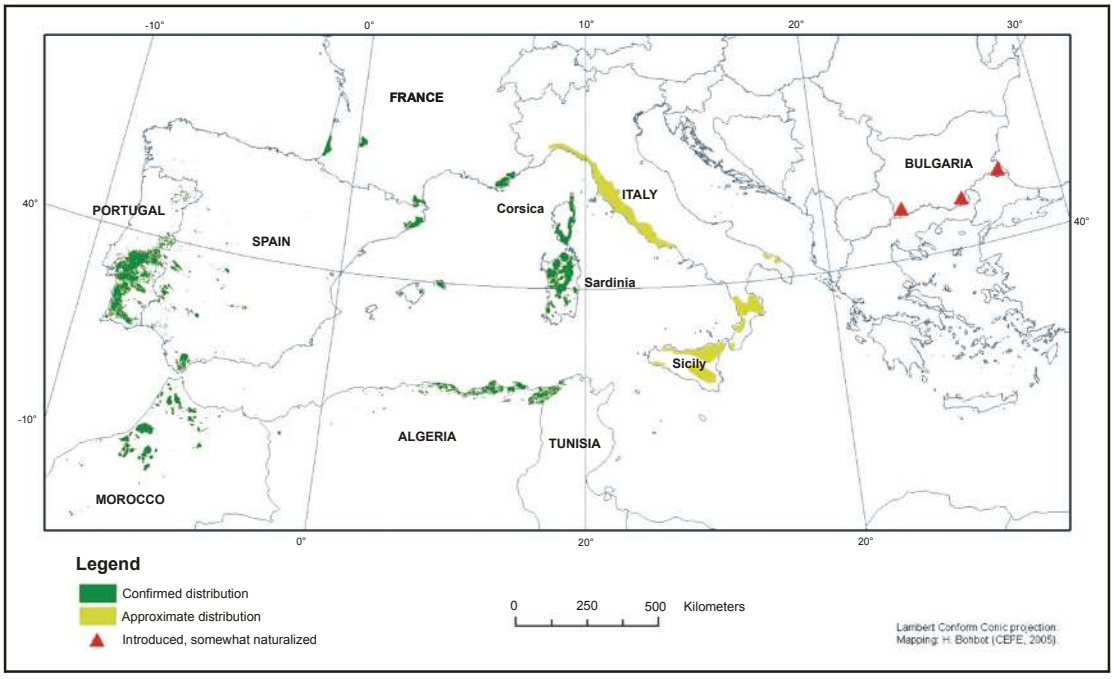
This process is repeated whenever the cork layer is removed. It is this characteristic of the cork oak that allows the sustainable exploitation of cork during the tree's lifetime by the periodical removal of the cork layers when they have attained a thickness enough to make a wine stopper (between 9 and 12 years) (Pereira & Tome, 2004).

3. WHERE DOES CORK COME FROM?

Cork oak trees exist within cork oak landscapes, which are mosaics of habitats comprising diverse mixed forest types such as holm oak and deciduous oak species, stone and maritime pines, wild olive trees, maquis and rich pastures.

Cork oak landscapes extend over an area of almost 2.7 million hectares (ha), in seven countries: Portugal; Spain; Algeria; Morocco; Tunisia; Italy and France. In Spain and Portugal the cork oak landscapes are often dominated by a unique silvo-pastoral system shaped by humans, combining open woodlands with more or less dense tree-cover, high quality pastures and rotation crops. These are called *montado* in Portugal, and *dehesa* in Spain. These cork oak habitats (natural landscapes, *dehesa* and *montado*) have been ranked among the most valuable in Europe and are listed in the EC Habitats Directive.

Figure 2. Approximate cork oak (*Quercus suber)* distribution. H Bohbot, J Aronson & C. Fontaine CEFE/CNRS, Montpellier, 2005. Carried out in the context of the EU funded CREOAK programme: QLRT2001-01594



Sources: Algeria (Alcaraz, 1977; Barry *et al.*, 1974; Gaussen, 1958, France (IFN, 1988-2003), Italy (Bellarosa & Schirone, 1997), Morocco (Sbay *et al.*, 2004), Portugal (DGF, 2001), Sardinia (Arigoni, 1968), Spain (Ceballos Fernandez de Córdoba, 1966), Tunisia (Khaldi, 2004, after IFPN-DGF, 1955) Bulgaria (Petrov & Genov, 2004).

4. WHY ARE CORK OAK LANDSCAPES IMPORTANT?

Cork oak landscapes have proven biodiversity, environmental and ecological values.

These landscapes are one of the best examples in the Mediterranean for balancing conservation and development for the benefit of people and nature. They sustain rich biodiversity and traditional livelihoods, provide opportunities for development in economically and socially disadvantaged areas, and play a key role in ecological processes, such as water retention, soil conservation or carbon storage. (Montero and Torres, 1993).

Biodiversity values

The Mediterranean is one of the 25 global 'hot spots', characterized by a high level of species diversity (Myers & al, 2000).

It has 13,000 endemic plant species, the second highest number in the world after the tropical Andes (Birot, Merlo & Paiero, 2005). Mediterranean forests contain 150 endemic (exclusively native to a place or region) tree species (Quezel *et al*., 1999). The cork oak is one of them.

In cork oak landscapes, plant diversity can reach a level of 135 species per square metre, and many of these species have aromatic, culinary or medicinal uses. Animal diversity is also high. Cork oak landscapes are important for the most charismatic and threatened species in the Mediterranean (Table 1), and a large number of migratory and wintering birds from Northern Europe, including virtually the entire European population of common cranes. They also contain a rich diversity of fauna, including endemic spiders, spade foot toads, geckos, skinks, vipers, mongoose, wild cats, roe deer, boars, Barbary deer and genets.

Cork oak landscapes are particularly well adapted to the harsh Mediterranean climate and soil conditions, supporting high biodiversity levels and sustainable economic activities (WWF MedPO and ERENA.) This makes their maintenance and protection crucial, and means that biodiversity conservation cannot be separated from economic and social development (Birot, 2005).

Cork oak landscapes include a number of tree species such as other oaks (holm oak, Afares oak, etc.), pines, ash and smaller species such as strawberry trees. The fertile undergrowth is commonly populated with heathers, leguminous plants, rockroses and herbs. The forests contain more than 30 species of brackens, some of which are very unusual, such as *Psilutum nudum, Culcita macrocarpa,* or *Pteris incompleta.* Cork oak micro-flora are numerous and contain many species of fungus.

Table 1. Key examples of threatened species found in the Mediterranean cork oak landscapes.

Species	**Estimated numbers**
Iberian Lynx *(Lynx pardinus)*	Fewer than 100 (not counting cubs of the year)[i]
Iberian Imperial Eagle *(Aquila adalberti)*	150 breeding pairs[ii]
Barbary Deer (*Cervus elaphus barbarus)*	Found only in North West Tunisia and North East Algeria. No available estimate of number of individuals.
Black Vulture (also known as Cinereous Vulture) *(Aegypius monachus)*	1,050-1,150 breeding pairs in Spain (based on Tucker & Heath (1994)[iii] 800 breeding pairs in Spain (based on Castro & al, 1997)[iv]
Black Stork (C*iconia nigra)*	A total estimate for Spain of 350-400 breeding pairs[v]

Millions of wintering birds from northern Europe, including the European population of common cranes, shelter in cork oak landscapes.

The forests, *dehesa* and *montado* play an important role for migratory birds. The majority of birds migrating through the Gibraltar Straits come from western Europe. Storks, kites, vultures, buzzards, booted- and short-toed eagles gather at bottlenecks where thermals enable them to gain great height and cross safely to the opposite shores. For this reason, the Straits of Gibraltar, together with the Straits of Messina and Bosphorus, are the main crossing points for hundreds of thousands of soaring birds moving into Africa. The cork oak forests near the Straits (Los Alcornocales Nature Park, Spain, and North of Morocco) therefore occupy a strategic position in all these movements.

Los Alcornocales Nature Park is situated in the heart of Andalusia, beside the Costa del Sol, Spain. More than 600,000 soaring birds were observed in five observatories in the south of Los Alcornocales between July and November 2005 (Junta de Andalucía, 2006), Table 2), in addition to more than 371,000 non soaring birds of 50 species (Tellería, 1981).

Table 2. Flow of soaring birds seen from the observatories at Gibraltar Straits in 2005.

Species		**N. of birds**
Ciconia ciconia	White Stork	197,802
Ciconia nigra	Black Stork	4,534
Pernis apivorus	Honey Buzzard	94,331
Elanus caeruleus	Black-shouldered Kite	1
Milvus migrans	Black Kite	245,247
Milvus milvus	Red Kite	29
Gypaetus barbatus	Lammergeier	1
Neophron percnopteruse	Egyptian Vulture	2,962
Aegypius monachus	Black Vulture	2
Gyps fulvus	Griffon Vulture	155
Circaetus gallicus	Short-toed Eagle	21,506
Circus aeruginosus	Marsh Harrier	316
Circus cyaneus	Hen Harrier	15
Circus pygargus	Montagu's Harrier	603
Circus sp		92
Accipiter gentilis	Northern Goshawk	1
Accipiter nisus	Sparrowhawk	3,285
Buteo buteo	Buzzard	123
Aquila adalberti	Iberian Imperial Eagle	4
Hieraaetus fasciatus	Bonelli's Eagle	4
Hieraaetus pennatus	Booted Eagle	28,388
Pandion hallaetus	Osprey	59
Falco naumanni	Lesser Kestrel	289
Falco tinnunculus	Kestrel	97
Falco naumanni / tinnunculus	Lesser Kestrel / Kestrel	214
Falco subbuteo	Hobby	60
Falco eleonorae	Eleonora's Falcon	4
Falco peregrinus	Peregrine Falcon	17
Falco cherrug	Saker	2
Falco sp		10
Raptor not identified		1,200
TOTAL		**601,376**

Source: JUNTA DE ANDALUCÍA, 2006. Consejería de Medioambiente. www.juntadeandalucia.es/medioambiente

Environmental services

Forests and woodlands play a vital role in protecting the environment. This is particularly true of steeply sloping watersheds where tree roots bind the soil and protect it from erosion and landslides. Uncontrolled forest clearance in upland areas can have major repercussions further downstream.

Soil conservation

Cork oak trees help to conserve soil by providing protection against wind erosion and increasing the rate at which rainwater infiltrates and recharges groundwater. The water erosion rate is also lower in areas that are directly influenced by upland forests and woodlands, because they intercept the rainfall.

Case study: The Spanish *dehesa*

The *dehesa* of South-Western Spain provides an excellent illustration of the environmental services of cork oak landscapes. *Dehesas* have been managed by people for centuries and have preserved the woodland cover alongside the use of natural resources. They are mainly mixed formations of oak species dominated by Holm oak (*Q. ilex)* and Cork oak (*Q. suber)*. The diversified production found in *dehesas* includes pasture, acorns, tannin, fodder, firewood, agriculture, honey, aromatic plants, cork, livestock and game. (Moussouris and Regato, WWF MedPO, 1999)

Environmental values of dehesas include:

- **The treetops of the dehesa create a microclimate that is less extreme in winter and summer, which allows a longer growing season for the herbaceous vegetation.**
- **Because cork oak trees intercept on average 26.7% of total precipitation (Mateos & Schnabel, 1998), they decrease the amount of water runoff, thus preventing soil erosion.**
- **They have a high water retention capacity, due to their porosity, and organic content (Joffre and Rambal, 1988).**
- **The cork oak trees reduce wind speed, and hence its drying effects through evaporation and transpiration.**
- **The trees of the dehesa supply large amounts of material which rots as humus into the upper soil.**
- **They are able to bring a large amount of nutrients from the lower to the upper soil levels, which are otherwise inaccessible to herbaceous vegetation.**
- **The trees increase the biological diversity of the system.**

Water protection

Eroded soil may be carried by streams and rivers and deposited in reservoirs linked to irrigation and hydro-electricity projects, thus reducing the capacity and shortening the life of these costly investments.

Carbon sequestration and energy conservation

Cork oak landscapes also contribute to store carbon, reducing greenhouse gases in the atmosphere.

All plants absorb carbon dioxide (CO_2,) as they grow, which they store. Carbon uptake is greatest in the early years when the rate of growth of the tree is at its maximum; it then tapers off as the tree reaches maturity. In Spain, the Andalusian forests store 151 million tonnes of CO_2, of which, the cork oak trees store about 10.7% (Montero, Muñoz & Agudo, 2005).

Each time cork is harvested, cork bark regenerates itself. Cork oak trees store CO_2 in order to regenerate, and therefore a harvested cork oak tree absorbs 3 to 5 times more than one which is not harvested, thus benefiting the atmosphere (Gil *et al., 2005*).

Table 3. Ecological value of cork: lifecycle impacts of wine stoppers.

Cork
A natural resource, renewable, biodegradable and recyclable
• **Natural cork is an environmentally-friendly material that completely biodegrades or can be readily recycled without creating any significant secondary waste.** • **After use as a stopper, the cork biodegrades without producing toxic residues or may be recycled into other products.**
High environmental values, low environmental impact
• **1 tonne of natural cork stoppers (357,143 stoppers) comes from 10 ha of *dehesa* or 1.3 ha of dense cork oak forest.** • **To obtain 10t of cork harvesters strip 400 young trees (25 kg/tree/cycle) or 167 mature trees (60 kg/ tree/cycle).** • **Trees don't die after harvest.** • **1 t of virgin cork and 7.3 t of waste cork are produced and used for granulate or cork board for insulating or other uses. None of the cork is wasted. Even the fine particles of cork dust are collected and used as fuel to heat the factory boilers.** • **2t of CO_2 is fixed per 1t of natural cork stoppers**
Source: Torres, 2006.

Economic values

Cork is the sixth highest global Non Timber Forest Product (NTFP)[vi] export with an estimated annual export value of around US$ 329 million. Cork products generate approximately €1.5 billion in revenue annually (Natural Cork Quality Council, 1999).

Definitions of key cork products:

Natural cork stoppers are manufactured by punching a one-piece cork strip. they are produced in many different cylindrical or conical forms and sizes.

Multi-piece natural cork stoppers are manufactured with two or more pieces of natural cork glued together by a Food and Drug Administration-approved food contact glue. These closures are made from strips of thinner cork, where the cork is too thin to produce one-piece natural cork stoppers. Multi-piece cork closures are not used for prolonged maturation periods.

Colmated cork stoppers are natural cork stoppers with their pores (lenticels) sealed with cork dust, which results from rectifying natural cork stoppers. Colmation improves the visual aspect of the cork closure, and improves its performance. They are manufactured in a variety of forms and dimensions.

Champagne and sparkling wine cork stoppers are specially designed to seal champagne**,** sparkling and gasified wines.

Technical cork stoppers are created for bottled wines which are consumed within a period of two to three years.

Agglomerated cork stoppers are entirely made of granulated cork, derived from by-products that are a result of the manufacture of natural cork closures.

Capsulated cork stoppers (bar top cork stoppers) are natural (or colmated) cork stoppers with a wooden, PVC, porcelain, metal, glass or other material bonded onto the top of the cork. This stopper is generally used in the bottling of spirits, liquors and fortified wines which are ready for immediate consumption, such as port, sherry, whisky, vodka and cognacs.

Insulation corkboard was invented in 1892 mainly to insulate cold storage areas in buildings and other locations requiring efficient insulation. It consists of various sizes of cork granules compressed together under a high temperature causing the granules to expand and giving them a dark brown colour. It is used for insulation between walls, for roofs, floors, around pipes, decorative effect for walls and ceilings, for soundproofing, and many gift items.

Natural cork parquet tile is the original, tried-and-true form of cork flooring, solid cork glue-down tile.

Sources: (http://www.corkmasters.com), (http://www.wecork.com/insulcork.html)

Cork is a versatile material that can be used for a variety of products, from clothes and shoes to fishing buoys, roofing material and floor tiles. Due to its extraordinary fire resistance, cork has also been used in rocket technology. Cork is also a ‘green’ product, which fits with current marketing and consumer trends.

The cork stopper

Despite the variety of cork products, it is bottle stoppers that drive the cork industry: they represent almost 70% of the cork market value (Table 4, Natural Cork Quality Council, 1999).

Table 4. Comparison of value of different segments of the cork industry as measured by revenue generated.

Industry segment	Value in Eurodollars (000)
Wine stoppers	1,000,000
Floor and wall coverings	300,000
Expanded agglomerated cork	100,000
Other products	100,000
Total cork products	**1,500,000**

Source: Natural Cork Quality Council, 1999

Of all the products obtained from cork, the stopper has the highest added value. The value (in €/kg of product) for a natural stopper can be 25.5 times more than for corkboard used for insulation (ICMC, 2005). The following table illustrates this value differential.

Table 5. Final price of cork products.

Cork product	Price (€/kg)
Natural cork stopper	45.93
Champagne stopper	18.03
Colmated natural cork stopper	14.6
1+1 stopper (agglomerated + natural cork discs)	12.37
Corkboard stoppers (agglomerated cork)	6.59
Parquet	5.66
Decorative corkboard	3.1
Corkboard for insulating (black agglomerated cork)	1.8

Source: ICMC, 2005

According to Costa & Pereira (2001), around 60% of cork industry production comes from Portugal, 15% from Spain, 10% from other cork producing countries, and the remaining 15% from other countries. On average, the West Mediterranean cork oak landscapes produce about 300,000 tonnes of cork annually.

Table 6. Relative position of cork industry in Portugal.

Cork industry in Portugal	
R.P. from forestry area	21.28%
R.P. from forestry production	26.60%
R.P. from forestry G.D.P	16.00%
R.P. from forestry employment	10.10%
R.P. from total value of national exports	3.2%

Source: Mendes (2002)

Other valuable goods and services from cork oak landscapes

- Cork oak landscapes provide valuable grazing. In North Africa and Iberia, livestock are an important source of income (see Figures 3, 4, 5). In addition, many certified European meat products from Iberia come from extensive cattle raising in these areas. For example, in 2004 in Spain, Jamón de Huelva DOP had 241 livestock farms registered, with an estimated annual market value from protected and certified meat products of €23,792,355.80 (cited by Torres, 2006).

- In the Andalusian cork oak woodlands, mushroom production is important to the economy of local communities, where there is a tradition of mushroom harvesting and consumption.

- Hunting game is primarily a recreational activity and provides a significant source of employment. The total value of game production in the main Spanish cork oak regions of Andalusia, Extremadura and Catalonia in 2003, reached €36 million (47% of total Spanish game value) (see Figure 3).

- The cork oak landscapes produce firewood and charcoal for heating and traditional cooking particularly in Morocco, Algeria, and Tunisia.

- Rural tourism has benefits for the local economy. In 2002, cork oak woodlands of Los Alcornocales Nature Park in Andalusia represented 5% of total Andalusian tourism, generating €86.91 million and 6,895 jobs.

Case study: Portugal

Cork is Portugal's most important forest product. Portugal is the leading country in cork oak cover and cork production and processing and produces around 60% of the cork products in the world.

96.4% of all Portuguese cork oak forests are privately owned, and 3.6% are owned by commercial forestry industries. Exports, rather than domestic consumption, have been the driving force of forest production in Portugal during the last century. Nowadays, forest products occupy fourth position in Portuguese exports, generating 11% of the total export value. The value of annual cork exports amounts to approximately €50 million.

At the end of the twentieth century, the forest sector represented 2.93% of the Gross Domestic Product (GDP) of Portugal (Mendes A., 2005 based on National Statistics Institute/Ine, Portugal 2001) of which 16% comes from cork production (Mendes A., 2002).

Cork represented 26.6%. of the total Portuguese forestry production value and, approximately 3.2% of the total value of national exports, supporting approximately 10.10 % of total employment in the Portuguese forest sector (Mendes 2002) (see Table 6.).

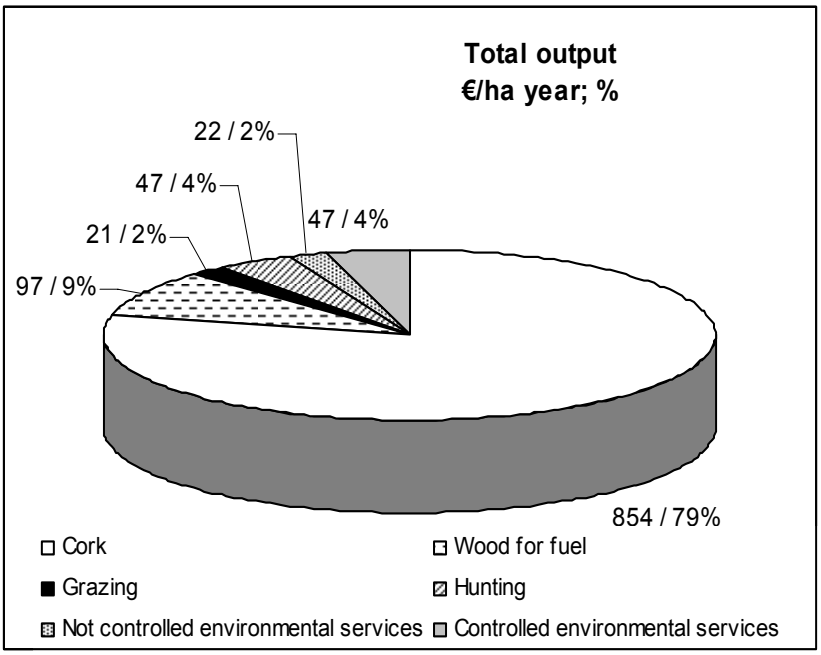
Alentejo is currently the most important and productive cork land area. It hosts more than two-thirds of the cork oak forest landscapes of Portugal. In 2000, the gross value of the cork in Alentejo represented 87% of forestry products.

The development of the wine industry sector since the eighteenth century has resulted in a steadily increasing supply of cork for the manufacturing of cork stoppers. This led to a growth in the commercial interest in cork which is now the major economic value of the Montados.

The cork oak forests in Alentejo are rich in aromatic, medicinal and 'honey' plants (mainly lavender). There are about 140 plant species of this type including lavender, mint, rosemary, and oregano. The forests are also rich in edible mushrooms that have an important commercial value such as *Tricoloma equestre, Amanita lepiotoides, Boletus edulis* and *Psalliota campestris.*

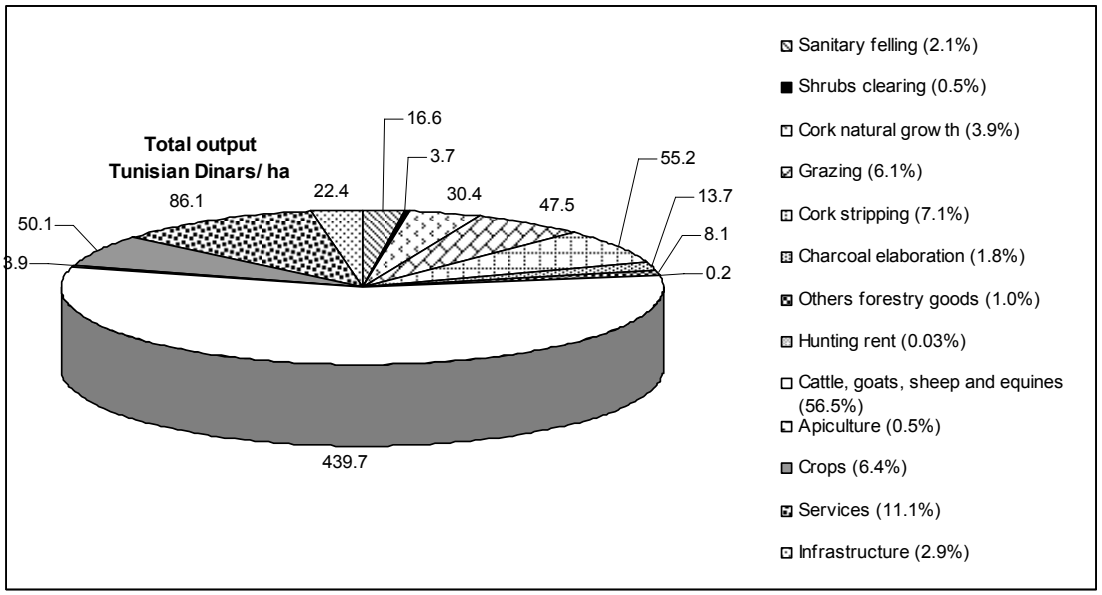
According to 1989 research into the autochthonous races of livestock animals (Mendes, 2002), the Montados (cork oak and holm oak together) of Alentejo hosted about 40,000 cattle, 1,050,000 sheep, 149,000 goats, and 6,000 pigs on a grazing surface of 1,356,000 ha).

Figure 3. Total outputs of a well-managed Spanish cork oak woodland (hypothetic mature cork oak woodland which naturally regenerates 0,7% of its area every year). Average yearly values.



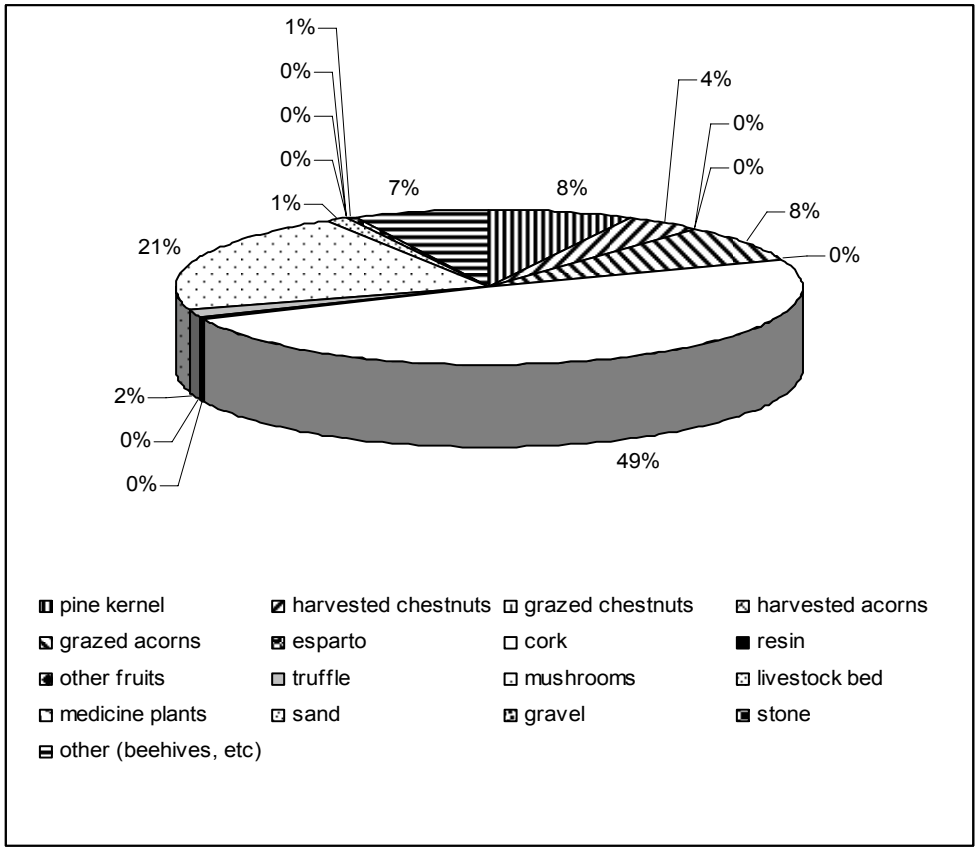
Prepared by Torres (2006), based on Campos *et al*., 2003.

Figure 4. Total outputs of a Tunisian cork oak woodland.



Prepared by Torres , 2006, based on Chebil *et al*. (2005). Tunisian Dinar TND .(1 Tunisian Dinar = 0,60 euros)

Figure 5. Percentage of Non Timber Forest Products in Spain (2003). Cork represents 49% (€113.106.801) of the total income generated from NTFPs in Spain (€230.652.182).



Source: INE, 2006

Social and cultural values

Cork oak woodlands provide employment and guarantee the survival of local communities. More than 100,000 people in the seven Mediterranean cork-producing countries depend directly and indirectly on cork economies.

Cork is a vital source of regional rural employment. Labour is divided between general silviculture and cork harvesting. These include managing fire prevention, maintaining the health of the woodland and opening paths to enable the transport of harvested cork to distribution depots, for example. The cork harvest requires professional cork strippers, supervisors, cutters, water suppliers, muleteers for transportation, cooks for the harvest team, and stackers and agents at the loading depots.

These jobs, as well as those related to cork manufacturing, mean that the cork industry occupies an important place in the Western Mediterranean, particularly in Portugal and Spain. In the Iberian Peninsula, the cork sector employs 34,654 people of whom 22,032 are in industrial jobs, and 12,622 are dedicated to cork harvesting. . 6,200 auxiliary jobs are associated with the sector, such as nurseries, transportation, security services, and equipment supply.

Table 7. Total direct employment in Portugal. (*) There are 10,000 seasonal forestry jobs which are equivalent to 4,167 permanent jobs. At least 28,052 families depend directly of cork oak woodland and cork industry in Portugal.

Employment in cork industry in Portugal		
Permanent jobs	Bark stripping	2.600
	Pruning	500
	Transport to the industries	277
	Charcoal	100
	Grazing	1.500
	Rangers	150
	Services (nurseries, public administration, associations)	200
Total permanent cork forestry jobs		**5.327**
Seasonal forestry jobs (5 months/year)	10.000*	4.167
Total cork forestry employment		**9.494**
Preparing Industries		1.000
Transforming Industries		14.000
Granulating and Agglomerating Industries		3.400
Machines building (for cork industries)		158
Total cork industry employment		**18.558**
TOTAL		**28.052**

Source: Mendes (2002)

Case study: the social role of cork oak forests in North Africa

According to the forestry outlook study for Africa (subregional report North Africa), undertaken in 2003 by the Food and Agriculture Organization (FAO) of the United Nations, the current primary roles of forests in North Africa are environmental protection and poverty alleviation, which are intimately linked. The same report indicates that improving the production and processing of NTFPs is crucial to ensure increased employment and economic growth.

Important rural populations, generally poor people in North Africa, live in the forests and their vicinity. State-controlled, publicly-owned forests are essential to the livelihoods of these local communities (M'Hirit, 1999). Forests are the safety net underpinning the economic and social survival of these local rural communities. For example, in Algeria, the total forestry and related employment represent about 1.2 to 1.5% of the country's labour force. The cork sector annually employs about 4,000 workers for harvesting and cork processing, which represents about 4% of the employment within the total forestry and forest related activities (Nedjahi and Zamoum, 2005). In 2004, Algerian cork exports earned 20 million Algerian Dinars.

Morocco has 350,000 hectares of cork oak forests. Of 277,000 ha with commercial potential, only 198,000 ha are under exploitation and effectively managed, meaning that currently almost 100,000 ha are not harvested. Cork production provides an annual income to rural communities in Morocco of approximately 100 million Moroccan Dirhams (approximately €10 million), representing 30% of total forestry sector income. Morocco exports over 95% of the cork it produces (AMIL, 2003). There are 45 cork harvesting enterprises and 14 processing cork companies, the latter employing 1,500-2,000 permanent workers. Cork forestry jobs across the sector account for an estimated 375,000 working days (Haut Commissariat des Eaux et Forêts et à Lutte Contre la Désertification (HCDEFLCD), 2003).

Cork oak forests also annually produce 5,000 tonnes of sweet acorns that provide food for people and animal feed, as well as 40 tonnes of mushrooms and 2,000 tonnes of honey. The Mamora forest alone produces 70% of Moroccan cork production, representing about 9,000 t annually (HCDEFLCD 2006). 300,000 inhabitants live in and around the Mamora forest and about 230,000 livestock. The area provides 600,000 cubic metres of fuelwood for heating & cooking (HCEFLCD, 2003).

In Tunisia, an economic study undertaken in Iteimia Forest in 2005 (Chebil, *et al*.,2005), shows the socio-economic importance of the cork oak forest to rural communities, based on economic activities such as grazing, cork harvesting and firewood collection. (see Figure 4, page 14).

5. THREATS TO THE CORK OAK LANDSCAPES

Cork oak landscapes now face a number of inter-related threats that put their sustainability at risk, including increasing human pressure on natural resources such as forest clearance for agricultural and other land uses, forest abandonment (particularly in the Northern Mediterranean), poor forest management practices, forest fires, changing climatic conditions, and associated diseases, as well as overgrazing. Many of these threats are caused by economic factors, often driven by policies and markets.

One major threat comes from the increasing risk of decline in the global cork market, due to the growing use of cork stopper substitutes, which threatens to reduce the market value of cork, and thus the incentive to preserve and manage cork oak forests.

Note to editors: the aim of this report is not to analyse the wider context or the complex set of forces which interact among them and influence cork habitats, but to focus on the threats coming from the market as a fundamental player underpinning the chances for cork conservation.

5.1 Current trends in wine and wine closures markets

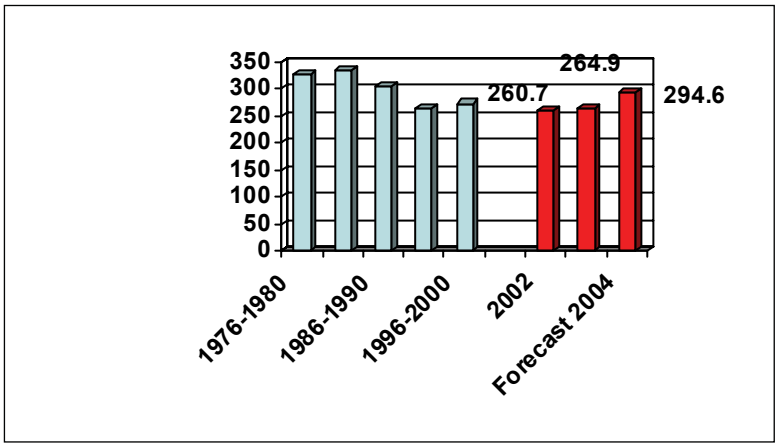
The importance of the stopper to the cork industry is due to the historical market relationship between cork and the wine industry. It is no accident that the word ‘cork’ is synonymous with ‘stopper’. Ever since the French monk Dom Perignon experimented with a new stopper for his sparkling wine in the early 1600s, cork stoppers have underpinned the global wine industry. The high elasticity of cork oak bark, its insulation capacity, lightness and durability, combined with its near-impermeability, have long made it an ideal material for bottle stoppers and the leading closure for wine.

Over 15 billion cork stoppers are produced every year and sold worldwide for wine bottle closures.

A number of changes have taken place in global cork stoppers markets in the last years, which have affected sales and revenues for the cork industry.

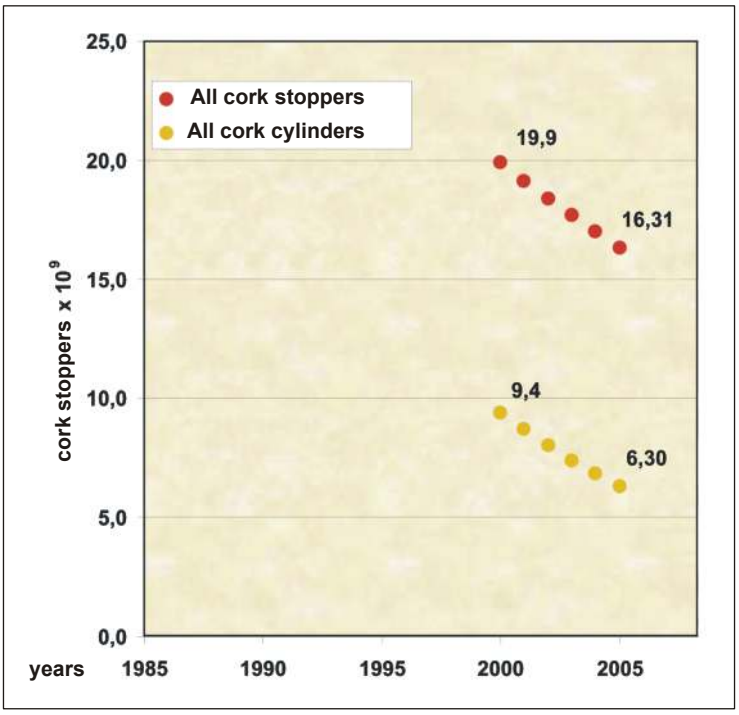
In spite of an increase in global wine production since 2000 (fig. 6), the cork stoppers market has not grown accordingly, as illustrated in the following graphs.

Figure 6. World production of wine in 1000 000 hl.



Source: OIV (International Organisation of Wine and Vine, World Statistics, General Assembly, Paris, 2005

Figure 7. Evolution of worldwide cork stoppers markets.



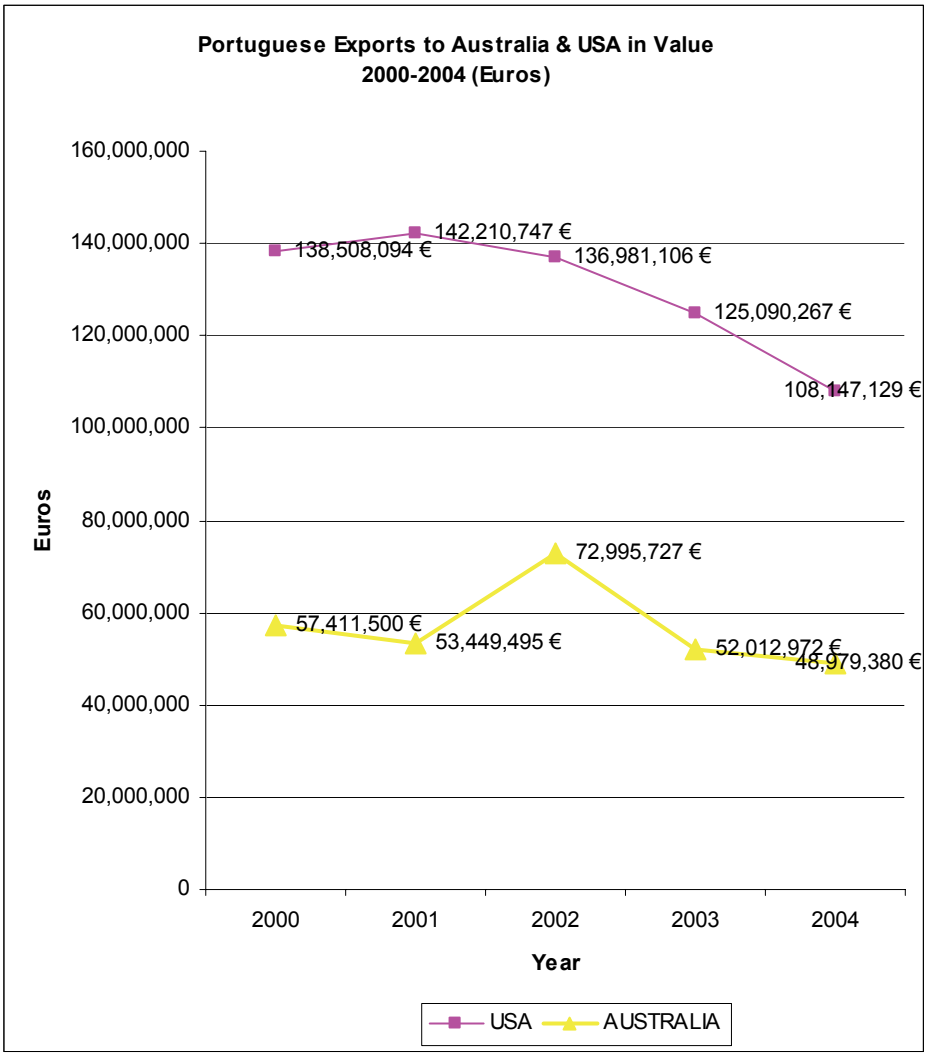
Source: ICMC, 2005

According to a survey carried out by ICMC looking at cork stopper sales (see fig. 7), between 2000 and 2005 an important decrease was observed in the share of the cork stoppers on worldwide wine markets, with the total drop reaching more than 3 billion stoppers, a loss of more than 18% in 5 years.

Portugal in particular has experienced a major loss in cork stoppers exports to Australia and the USA. Between 2000 and 2004, the export share to the USA was cut by more than €30 million and in Australia by €24 million between 2002 and 2004

(Figure 8). These trends are all the more worrying because in these countries wine production has increased during the same period.

Figure 8. Portuguese Total Cork Exports to Australia and USA (based on statistics from INE – National Statistics Department, Portugal).



One of the main reasons that explain such a trend was the increase in the use of plastic stoppers and aluminium screwtops by the wine industry.

Factors which may influence this situation include:

- Strong marketing has promoted alternative closures.
- Information about tainting by TCA in various media often places the blame on the cork, and can confuse consumers. People tend to blame taint problems on the cork, on the basis of misleading or incomplete information.

Is TCA a cork-only related taint?

Traditionally this mouldy taint was termed corkiness or cork taint, therefore leading to the assumption that the cork stoppers were the responsible for its transmission to the wine. However the contamination may come from three sources (and their combination): the wine, the cork stopper, and the external environment. The presence of halogenated phenols is widespread in the natural environment due to their extensive use in pesticides, herbicides and sanitation materials. Wine may contain TCA or TCA precursors before bottling, and the contamination with haloanisoles may occur in the cellar environment, e.g. in wooden materials, as well as during storage and transport. Therefore tainted wine is also found in bottles with non-cork stoppers or in plastic packages.

Source: Facts about tainted wine and cork, Pereira 2006,
Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Portugal

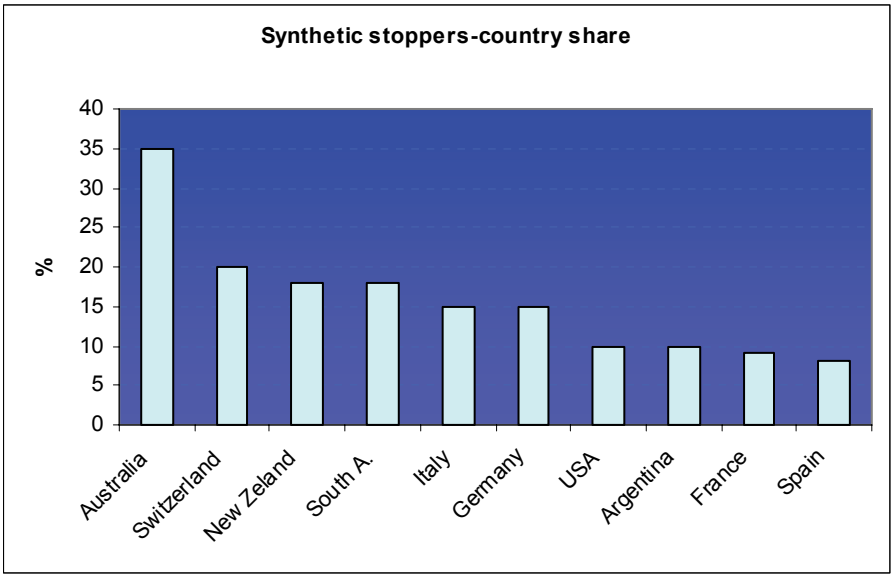
- The arrival on the market of cheaper wines produced for quick consumption, which are not intended to be aged. This is particularly true of the Australian wine market, and also valid for other expanding New World wine markets such as New Zealand and South Africa (ICMC 2005).

- Today, global wine production is increasing, according to recent OIV studies (source: OIV World Statistics, General Assembly, Paris, 2005). This has led to more competition in prices on wine markets and led producers to look for cheaper closures. The growth in the use of cheaper alternative wine stoppers is increasing the pressure on cork stopper prices, which affects the sale price of cork.

- Alternative stoppers are often referred to as ‘cork’ and imitate the appearance of cork, which can confuse customers.

- Consumers can’t know the type of closure they will find when they buy a bottle of wine, therefore they cannot express their preference and choices.

Figure 9. Alternative stoppers country share.



Source: ICMC, 2005

In Australia, more than one bottle in three has a alternative stopper. Switching from cork to alternative stoppers in countries which have traditionally used cork has also been observed and is increasing.

Current trends may not be considered just as fluctuations. If a wine producer decides to switch from cork to alternative stoppers, the decision is generally definitive, given that it requires the wine producer to invest in bigger and new equipment.

5.2 Future scenarios

In view of the trends described above, two scenarios were developed to identify potential future evolution and impacts of current trends of the cork stoppers market on the cork oak landscapes..

The two scenarios are based on data available and projections which show that if current trends continue, 1-2 million ha of cork oak landscapes could be lost or abandoned in the next 10-15 years (that is, up to three-quarters of the current cork oak forest area), with associated loss of employment and impacts on local people.

The first scenario is based on the hypothesis that the current trend will continue and the second looks at a worse case scenario where the current trends accelerate.

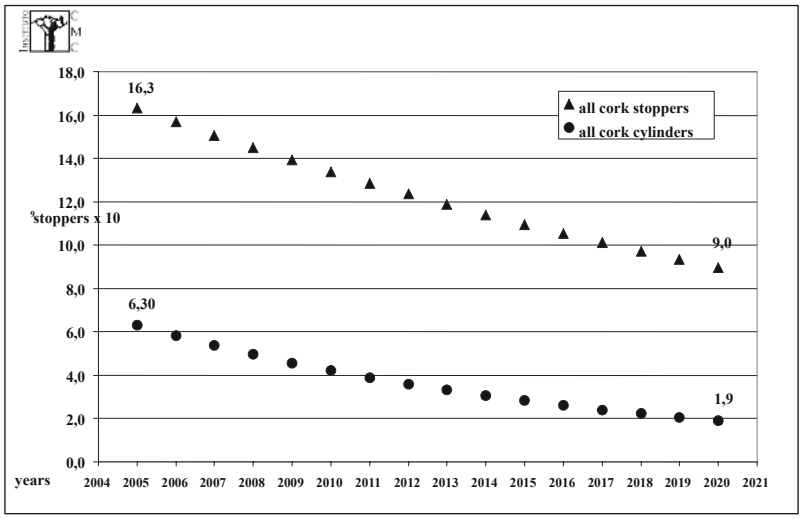
Scenario 1

Considering the results of the surveys carried out by ICMC (see fig. 7) looking at the trends in cork stoppers' market share between 2000 and 2005, there has been a decrease by 3 billion stoppers, equivalent to a decline of 18% in the cork stoppers market share worldwide. This corresponds to a substitution rate of cork by alternative closures of 7.7% per year.

The following scenario is based on the projection made by ICMC in 2006, based on the same substitution rate of cork by alternative closures reaching 7.7% per year.

According to this scenario (Figure 10), by 2020, cork stopper sales would decrease to 9 billion by 2020, compared to 16.3 billion in 2005.

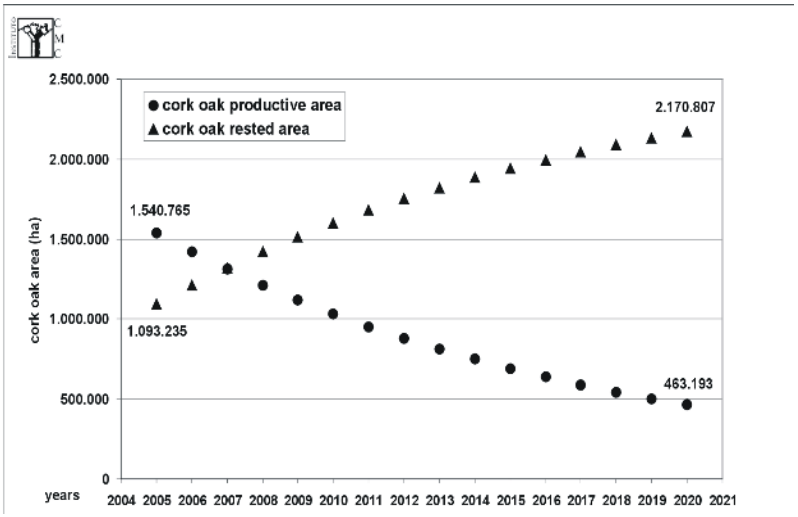
Figure 10. Projection of cork stoppers market evolution worldwide.



Source ICMC, 2005

According to this ICMC projection, by 2007 (see Figure 11) the area of cork oak forest being harvested will be the same as that which is un-harvested. By 2020, only 463,193 ha will still be harvested. This could put at risk 1,077,572 ha of cork oak forests which are currently harvested.

Figure 11. Potential Impact of decline in the cork stoppers market on the cork oak landscape.



Source: ICMC, 2005

The point at which the area of abandoned forest would be larger than the area of forest being actively harvested is fast approaching. If current trends are not reversed by the end of the decade there will be more abandoned land than harvested cork oak forests.

Scenario 2

This scenario is based on a recent study by Enrique Torres from the University of Huelva which uses available stopper and wine market data from 2003, and on the hypothesis that the market share for the alternative stoppers could double by 2008 in the global wine market while by 2015, 95% of wine produced could be closed with alternative stoppers, and only the remaining 5% of best quality wines closed with cork stoppers. The outcomes of these are presented in Table 8, page 25.

As a basis for developing his projection, Torres has used a different surface of productive cork oak area from the one used by Elena in Scenario 1. The total cork oak productive area for 2003 used by Torres is about 2,139,295 ha, based on data for Portugal (Mendes, 2002), Spain (Ministero di Medio Ambiente, 1998), Italy ISTAT, 1999, 2000), France (ICMC, 1991), Morocco (Ministry of Water and Forests, 1998), Tunisia (DGF, 1995,1998).

Elena estimated that in Scenario 1 the cork oak area under production would have already decreased to about 1,500,000 ha in 2005, taking into consideration the estimation of the impact of the increasing trend of substitution of cork stoppers.

Table 8. Projections based on a hypothetical scenario, whereby in 2008 the percentage of alternative stopper use is double that of 2003, and in 2015, 95% of wine production is closed with alternative stoppers.

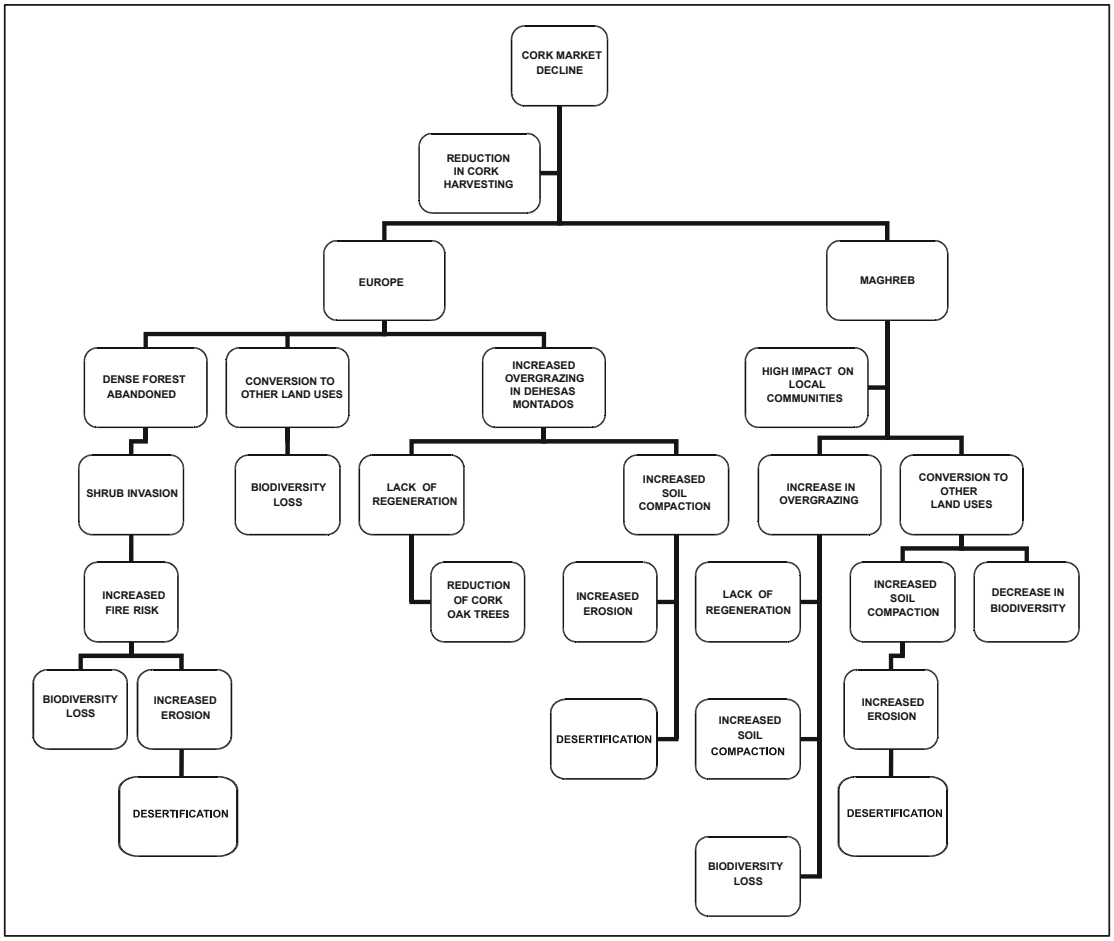
	2003	2008	2015
Worldwide wine production (millions of litres)	26,673	29,000	32,258
Wine consumption (millions of litres)	23,473	24,000	26,696
Number of stoppers (millions of units)	23,473	24,000	26,696
% alternative stoppers	12.1	24.3	95.0
Nº of cork stoppers (millions of units)	20,623	18,171	1,340
Nº of alternative stoppers (millions of units)	2,850	5,290	25,460
Harvested cork needed to process the number of cork stoppers needed (tonnes)	300,766	265,010	19,542
Area of cork oak woodlands needed to be harvested to process the cork (ha)	2,139,205	1,884,892	138,999
Industry jobs	29,376	25,884	1909
Number of daily wages / year	2,250,000	1,982,515	14,6198
Forestry jobs (only for harvesting)	37,500	33,042	2,437

Source: E.Torres, 2006

According to the scenario described by Torres (Table 8), if the alternative stopper market share were to double from the 2003 level by 2008, cork production would decrease to 265,000 t in 2008. This scenario also shows also that if the alternative stopper market share increases to 95%, cork production will decrease to 19,500 t by 2015. This would mean a decrease in the harvested cork oak woodland area of about 250,000 ha in 2008, and 2 million ha by 2015. This represents an impact on three-quarters of the total cork oak landscapes area in the Mediterranean. Therefore, by 2015, an estimated 2 million ha of cork oak forests would be put at high risk from fire, overgrazing, conversion, and degradation.

Loss of employment would be another consequence of the potential cork market crisis. The projected trends would result in a dramatic decrease in direct employment related to the cork sector, affecting the cork industry as well as cork harvesting. In the case where only the best quality wine (5% of total wine production in 2015) is closed with cork stoppers in 2015, 27,500 industrial jobs and 35,000 forestry jobs (harvesting) would disappear.

Figure 12. The likely consequences of a decline in the cork stoppers market on the cork oak landscapes.



Source: E. Torres, 2006

6. Conclusions

This report shows that changes in the cork stoppers market pose a major threat to the cork oak forests conservation. Projections used in this report suggest that unless current market trends are reversed, we may see accelerated loss and degradation to cork oak landscapes, which will be extremely hard to reverse.

This is because the survival of these cork oak landscapes is strongly linked to the maintenance of the market value of cork, which is currently dependent upon the wine stopper market. Cork oak landscapes can be either positively or negatively impacted by the decisions made now by the wine producer, bottler or seller. The increase in the market share of alternative wine stoppers, specifically plastic stoppers and screwtops, could cause a loss of the economic value of cork oak landscapes, thereby contributing heavily to the degradation of one of the best remaining examples of a system which balances the needs of biodiversity conservation and people.

Cork oak landscapes are natural assets that need to be preserved

- Cork oak landscapes have one of the highest levels of plant biodiversity observed in the world. They are also key areas for animal diversity including large numbers of migratory birds and some of the world's most endangered species such as the Iberian Lynx, the Iberian Imperial eagle and the only African deer (the Barbary Deer).

- The highest biodiversity in cork oak landscapes is not found in virgin/untouched forests, but rather in mosaic-like landscapes that have been influenced by people, to form some of the most remarkably sustainable agro-forestry systems. It is a special system which balances the needs of biodiversity conservation and people.

- Cork is natural and renewable. Cork oak harvesting is an environmentally friendly process as trees are not cut down. Instead, the bark is stripped every 9 to 12 years and the trees live on average between 100 and 300 years.

- Cork is biodegradable and recyclable. In the cork-producing countries, recycled cork is used to produce notice boards, placemats, coasters, floor tiles, gaskets, and insulation material.

- Cork oak landscapes also perform key ecological functions that include conservation of soil, protection against forest fires (because of its properties, cork is more resistant to fire than other trees), desertification and soil erosion.

The economic viability of cork products plays a critical role in preserving these natural assets

- Cork oak forests support more than 100,000 people in the Mediterranean, and are a unique model of the balance between people and nature.
- Because people get revenue from the cork oak forests that they maintain, they contribute to the preservation of entire ecosystems and help to fight against fires and desertification.

- While many goods and services are generated from the cork oak landscapes, today, it is cork that has the highest economic value.

The wine industry plays a vital role in maintaining the economic value of cork and the survival of cork oak forests

- Scenarios presented in this report show that 1-2 million ha of cork oak forests could be lost or abandoned in the next 10-15 years (this is half to two-thirds of the current cork oak forest area), with associated loss of employment and impacts on local people (with a loss of 62,500 jobs).
- Cork has many environmental, social and economic benefits, which fit the current market and consumer trends towards environmentally and socially responsible (ethical) products. For example, in the UK, Fairtrade sales reached £140m in 2004 – a 51% increase since 2003. Amongst the 20 countries across Europe, North America, Japan, Australia/New Zealand and Mexico that contribute to Fairtrade, the UK has the largest Fairtrade market[vii].

8. Recommendations

WWF calls on the wine and the cork industries to reverse the current and potential threats that affect the survival of cork oak landscapes.

In order to maintain the existence of the cork forests, the wine and cork industries need to take action now to maintain the markets for cork stoppers.

– The wine industry needs to demonstrate its corporate responsibility by considering the environmental and socioeconomic values of cork – by choosing cork and promoting its use among customers.

– The cork industry needs to maintain and improve the quality of cork stoppers (addressing in particular the issues related to TCA and traceability) and communicating progress to the wine industry and consumers.

– This all needs to be combined with improving management, protection and restoration practices in cork oak landscapes and promoting their credible certification. The cork and wine industries can help to secure this by engaging in and supporting FSC certification.

WWF aims to work with the cork and the wine industries to promote products from sustainably-managed cork oak landscapes, and to encourage responsible purchasing attitudes through the market chain, from cork and wine industries to end consumers.

By addressing the environmental and social corporate responsibilities which are more and more requested by consumers, WWF believes that industries offer added value to their consumers while working for nature. WWF also aims to continue to challenge the cork industry to produce a high quality product which will help guarantee the market share of cork stoppers.

It is clear that the future survival of cork oak forests rests largely on the market for cork stoppers and that the wine industry has a major role to play in meeting this challenge. If nothing is done, a rich biodiversity could be lost forever and the economy of the Western Mediterranean could be seriously damaged.

THE OVERALL VISION OF WWF: ‘in 30-50 years time cork oak forest landscapes are maintained and restored, supporting economically viable and culturally and socially beneficial multi-purpose management systems. This leads to sustainable livelihoods, increased perceptions of the whole range of values, goods and services of cork oak landscapes and improved biodiversity’.

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Endnotes

[i] J.N. Guzman, F.J. Garcia, G. Garrote. R. Perez de Ayala. 'Monitoring and status of the Iberian lynx (lynx pardinus) in Spain'. 2002-2004. Paper presented in the second international seminar on the conservation of the Iberian Lynx

[ii] Source: Action Plan for the Spanish Imperial Eagle (*Aquila adalberti*), compiled by L. Mariano Gonzalez (DGN Spain) at http://europa.eu.int/comm/environment/nature/directive/birdactionplan/aquilaadalberti.htm

[iii] Source: Action plan for the Cinereous Vulture *(Aegypius monachus*) in Europe, compiled by B. Heredia (Birdlife International UK with contributions from A. Abuladze (institute of Zoology, Gerogia). February 1996.

[iv] Source: Los Bosques Ibéricos – Una interpretacion geobotanica. by E. Blanco Castro & al. Ediotrial Planeta, S.A., 1997., printed in Spain. Pp 555.

[v] Source: CBS. S.L:, oct 2003. Catalogo Nacional de especies Amenazadas. Ciconia nigra. www.mma.es/conserv_nat/acciones/esp_amenazadas/html/catalogo/Vertebrados_Aves/ver7.pdf

[vi] Non-timber forest products (NTFPs) are a collection of biological resources derived from both natural and managed forests and other wooded areas (Peters, 1996).

[vii] Source: www.fairtrade.org.uk/about_sales.htm`