Information Bureau | 2016

CORK – ENVIRONMENTAL IMPORTANCE

APCOR
Portuguese Cork Association

INDEX

MONTADO

The "montado" is the Portuguese term used to describe landscapes which are a specific, delicately-balanced ecosystem, comprising of mixed farming, centered around extensive oak woodlands, interspersed by areas of shrubs, grassland and cultivated fields.
It is neither agricultural, forestry nor pastoralism, but an integrated mix of all three, designed and developed over millennia to secure greatest abundance from often harsh and inhospitable conditions, ensuring the land's productivity for future generations.
The montado can vary from thick forest to more open grassland and scrub vegetation areas interspersed by trees. The average density is approximately 80 trees per hectare, although it can be 120 trees or more, and up to 5 per cent of the total area may be used for growing cereals such as wheat, barley and oats, and 40 per cent may be used as pastures.
The main species that dominate the montados are of the genus Quercus, presenting large areas of holm oak (Quercus rotundifolia), small areas of Pyrenean oak (Quercus pyrenaica) and – the majority – cork oaks (Quercus Suber L).
The Quercus Suber L is a medium-sized evergreen oak that has a thick corky bark that is periodically stripped to yield commercial cork.
Cork oak forests grow from sea level up to 500m in the humid and warm climates of the Mediterranean basin, particularly in the southern regions of the Iberian Peninsula influenced by the Atlantic Ocean.
The cork oak as a species is well suited to the Mediterranean climate, characterized by dry summers and mild winters - with temperatures ranging from -5ºC to 40ºC - with minimum yearly rainfall of 400 mm, maximum yearly rainfall of 1700 mm, and soil pH ranging from 4.8 to 7,0[1].
Covering a worldwide area of over 2,1 million hectares, cork forests are found in Portugal, Spain, Algeria, Morocco, Italy, Tunisia and France. Portugal represents over 30 percent of the total, with the largest areas located in the Alentejo (84 percent).
It should be noted that areas of montado have increased in recent years, from 731 thousand hectares in 2006 to 736 thousand in 2010 in Portugal. There are also a number of reforestation programs which have given rise to an average increase of 3.3% in forest areas over the last 10 years. Over 130 thousand hectares were planted in Portugal and Spain in the last years, with an approximate density of 120 to 150 cork oaks per hectare. Cork that is being extracted from these trees will used briefly.

THE MONTADO'S BIODIVERSITY

Biodiversity can be defined as "The variety of life in all its forms, levels and combinations. Includes ecosystem diversity, species diversity, and genetic diversity" (IUCN, UNEP and WWF, 1991).
The role and value of biodiversity and ecosystem activities have been recognized on an international scale as a valuable platform for reducing poverty and desertification and promoting sustainable development. The Convention on Biological Diversity (CBD) signed by over 180 governments manifestly recognizes its important role[2].
Cork oak landscapes have proven biodiversity, environmental and ecological value. These landscapes are one of the best examples in the Mediterranean for balancing between 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).

[1] Helena Pereira – A Cortiça (2004)
[2] UNEP – Biodiversidade e Erradicação da Pobreza – Maio 2007

ENVIRONMENTAL IMPACT

Carbon Sink

Eleven of the warmest years in the past 125 have occurred in the last 20 years, with 2005 the warmest on record. The overwhelming consensus is that this is due to emissions of greenhouse gases such as carbon dioxide (CO2). Warming in this century is projected to be between 1,4ºC and 5,8ºC. The impacts of climate change are already visible[3]. It is in this field that the cork oak tree plays a vital role. In addition to producing oxygen through photosynthesis, the unique cell structure of the Cork Oak traps carbon, which contributes to global warming.

Given the carbon retention potential of cork, every time a consumer reaches for a natural cork sealed wine bottle there is a direct contribution to the environment. A CTCOR – Technological Centre for Cork – study indicates that by consuming 15 billion cork sealed bottles, the pollution released by 45 thousand vehicles/year (with a mileage of around 15 thousand kilometres) is retained. According to CTCOR, a vehicle releases 170g of CO2 per kilometer whilst a single cork stopper is able to retain approximately 8 grams of CO2 – double its own weight. In short, 118.500 tons of CO2 are retained by 15 billion natural cork stoppers each year.

Luis Gil, a researcher at the Portuguese National Institute for Engineering and Industrial Technology (INETI), revealed some interesting facts. By following doctors' advice and drinking two glasses of wine a day (2,5 dl wine/day) - equal to a 0,75l bottle of wine per person in three days – a consumer purchases 122 natural cork stoppers per year. By doing this, wine drinking consumers retain 1.183,40 grams of CO2 from the atmosphere - the equivalent to a 7 km vehicle mileage/year[4].

In addition to these studies, the latest (2014) IPCC document (Intergovernmental Panel on Climate Change) of the UN reiterates what is now accepted by scientific community: the increase in concentrations of greenhouse gases such as carbon dioxide (CO2) in the atmosphere is responsible for the important climate changes. While Mankind is responsible for the burning of fossil fuels, the assimilation and storage in the medium-term carbon in forests can contribute to the mitigation of carbon dioxide emissions from fossil origin. In this context it has been conducted studies that quantify the annual carbon retention capacity of the montado. For example, in central Portugal (Évora), a low density montado (about 30% tree coverage) retained an average 88g of carbon per m2 per year (i.e. 3.2 tons of CO2 per hectare per year). But the annual carbon sequestration in a montado in best climate and soil conditions, with certified forest management and with more plants (50% tree cover), quadrupled that figure to 400g of carbon per m2 per year (i.e. 14.7 tons of CO2 per hectare per year)[5]. However, the occurrence of adverse conditions such as a dry year can lead to significant decreases in carbon sequestration (about 40%).

"Cork Carbon Footprint: from cork to products" is the name given to the project developed by University of Aveiro and by Instituto Superior de Agronomia (ISA). This project has as main goal to evaluate the role of the cork sector in mitigating greenhouse gas emissions (GHG) in Portugal, i.e., the emissions and removals of GHG throughout the whole cork sector from the forest to the final disposal of the cork products, including its industrial processing.

Which concerns to carbon sequestration in the montado, the study concludes that the montado of Herdade da Machuqueira do Grou (Coruche) represented a carbon sink of about 250g of CO2/m2/year (average from 2009 to 2014), having been a sinkhole even in dry years of 2009 and 2012. This result confirms the stability of this montado in terms of carbon sequestration and contrasts with the obtained results in a low density holm oak montado of Évora, with a balance close to zero in dry years.

The preliminary results also show that stripping had no significant impacts in carbon balance at tree and ecosystem level in the very dry year 2015.

[3] climatechange.com

[4] João Santos Pereira – Do Sobreiro à Cortiça – um sistema sustentável

[5] Filipe Costa e Silva (ISA)

At the point of the project related to carbon accumulation in cork products, the same study concludes that cork products produced from domestic cork are growing reservoirs of carbon, either when they are being used or when they are landfilled, having accumulated between 40 and 70 thousand tons/CO2 / year in the last 15 years.
Thus the use of cork products contributes to mitigate the climate changes, not only because of its capacity of accumulate carbon but also by the fact of replacing more intense alternative products in an energetic point of view. The calculation model developed in the project enables cork products of being included in the national greenhouse gases inventories, as is already the case of wood products.
Note that the project was developed between July 2013 and November 2015, and the various stages of the study and the information set that was produced during their implementation is available at http://corkcarbon.web.ua.pt.

Soil conservation
Cork oak trees help to conserve soil by providing protection against wind erosion and increasing the rate at which rainwater infiltrates and replenishes groundwater. Because cork oak trees intercept on average 26,7% of total precipitation[6], they also decrease the amount of water run-off, thus preventing soil erosion.
Cork oaks 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.
They have a high water retention capacity due to their porosity and organic content (Joffre and Rambal, 1988).

Microclimate
The treetops of the Montado create a microclimate that is less extreme in winter and summer, which allows a longer growing season for the herbaceous vegetation. Cork oak trees also reduce wind speed, which helps protecting crops.

SOCIAL AND ECONOMIC IMPACT

Montados are one of the few examples of fully sustainable forestry exploitation. They are economically sustainable, due to the high market value of cork.
Besides that, a recent study carried out by CE Liège and Corticeira Amorim shows that the environmental services of the cork oak forest are valued at least 100 euros per year per hectare.
Despite the wide variety of cork products, it is bottle stoppers that drive the cork industry: they represent almost 72% of cork's market value.
Work in the montado is mainly seasonal and limited to the harvesting season. The number of jobs in the cork industry is estimated at 9.000, in forestry exploration it represents 6.500 of jobs and thousands of indirect jobs related with other cork oak forest products (livestock farming, restaurants, tourism, etc.).

Desertification prevention
Desertification – whether the result of natural causes or human misuse / neglect – is one of the most pressing problems facing humanity today. In rural areas this can only be prevented by means of sustainable land use and maintained economic viability.
Cork oaks are a fundamental tool in the fight against desertification in Portugal, with a decisive role to play in preventing soil degradation. Cork oak forests, which constitute ecologically and economically sustainable systems, serve as an important tool in preventing desertification, as they generate high levels of biodiversity; they improve the organic matter of soils (after extracting nutrients from deeper

[6] Mateos & Schnabel, 1998

levels, they return them to the soil in the form of falling leaves, creating fertile soil); they help regulate the water cycle (by increasing the amount of organic matter in the soil, they contribute towards greater water retention, facilitating its infiltration into the soil and reducing losses by surface run-off) and halt depopulation (by acting as economically viable agroforestry systems[7]).
No other substitute product of cork can be this sustainable from the environmental perspective, taking into account the poor soil and harsh climate.
In some towns, cork is the main output that keeps these areas alive with economic and social activities. Cork not only creates wealth, but also distributes it, making these regions economically viable.
From an urban perspective, residents also rely on this unique ecosystem, both locally and from a distance, for the regulation of water and air control, small-scale agricultural production, home and personal products as well as for leisure and recreation.

Rural Activities
Some of the activities that take place in these rural landscapes in parallel to the harvesting of cork include:

1. Hunting and Fishing

Along the lakes and rivers of the Alentejo fishing is a favourite sport. One of the most common fish found in these rivers is the Black Bass (Achigã).
The forests are also sources of wild game, such as partridge and wild boar. Hunting is common, although seasonal, restricted to certain areas and regulated by laws. Hunting is not only seen as a recreational activity but also ensures continued stocks, provides another source of food and a source of employment.

2. Cattle Breeding

In the montado some farmers breed indigenous pigs, sheep, goats and cattle which graze on the open areas of grassland. The pork is salted and smoked, and the final smoked ham product provides a year-round local protein source as well as being sold internationally. Many certified European meat products from Iberia come from cattle raising in these areas. The goats, on the other hand, provide renowned fresh cheeses and the sheep cured cheeses.

3. Herbal and Medicinal Plants

Forests make a significant direct contribution to the food security of rural populations. A wide range of food sources can be found in cork oak forests including seeds, acorns, fungi (mushrooms) and herbs. Acorns are a food supplement to the indigenous pigs, resulting in their meat being regarded as superior quality due to their acorn diet.
The rock rose provides firewood (used in traditional stone-built bread ovens outside people's homes) and - along with lavender and heather - is fed on by bees kept for pollen, honey and candle-wax.
Another provider of food and income are the wild fungi associated with the cork oak trees. Many of these are edible mushrooms - amanita caesarea, boletus aereus, boletus edulis, cantharellus cibarius, marasmius oreades, terfezia leptoderma etc - which fetch high prices in the market, and are an essential economic supplement for many families.
The strawberry tree, as another example, provides berries for alcohol and cooking fuel, often collected and sold at local trading posts.
The economic value of the natural landscape alone is therefore very high.

[7] World Wide Fund for Nature (WWF) - O sobreiro, uma barreira contra a desertificação (2008)

4. Ecotourism

Ecotourism is a relatively new word and it can be defined as "Environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features both past and present) that promotes conservation, has low negative visitor impact and provides for beneficially active socio-economic involvement of local populations."[8]
As a result, tourism can potentially bring great benefits to rural areas. It is an important source of employment for local communities, and can also serve as a marketing tool to attract potential residents and business to a region. In the local towns, amidst the cork oak forest regions, a number of small lodges, hotels and camps have supported local communities in terms of employment, training and the setting up of income generating projects.
Small scale ecotourism has served to heighten the environmental awareness of those who visit the landscape, promoting nature conservation by means of a broad spectrum of outdoor recreational activities including hunting, fishing, camping and bird watching.

CORK OAK FORESTS AND WILDLIFE

Montados safeguard a wide range of habitats for flora and fauna and are the reason that the Mediterranean is known as one of the 35 global 'hot spots'.[9]

Flora

ROCK ROSE

LAVENDER

DIGITALIS PURPUREA

The Mediterranean Basin is home to between 15 and 25 thousand plant species, half of which only exist in the Mediterranean, meaning they are endemic to the region. The cork oak tree is one of them[10]. It is also the region of the world with the third highest number of endemic plant species[11].
In cork oak landscapes, plant diversity can reach a level of 135 species per 1000 square metres[12] and many of these species have aromatic, culinary or medicinal uses, including various types of lavender, oregano, rosemary, mint and digitalis. The harvesting of these plants and subsequent processing (through drying and distillation) is an important economic resource for local inhabitants.

Cork oak forest undergrowth includes shrubs and bushes such as heather, gorse, broom and lavender, as well as rock rose and strawberry trees.

8 Hector Ceballos-Lascurain (1983)
9 Conservation International (http://www.conservation.org/How/Pages/Hotspots.aspx)
10 João Santos Pereira – Do Sobreiro à Cortiça – um sistema sustentável (2008)
11 Myers, Norman & al - Biodiversity hotspots for conservation priorities (2000)
12 Díaz-Villa MD, Marañón T, Arroyo J, et al. 2003. Soil seed bank and floristic diversity in a forest-grassland mosaic in southern Spain.J Veg Sci 14: 701-709

In addition, in a study carried out at the Field Station of the Centre for Environmental Biology in the Grândola Mountain Range, 264 species of fungi (of which 83 are edible), 20 hepatic species and 50 mosses were identified.
The grass species Avenula hackelii or the legume Ononis hackelii are two examples of endemic plants found in montados. Mushrooms are another species found in the montado, some of them highly valuable (Pereira, Santos: 2008).

Fauna
The Mediterranean Basin is home to 770 vertebrate animal species, of which 235 are endemic to the region, divided among:

Table 1 – Animal Species of the Mediterranean Basin

Type	Species	Endemic
Birds	345	47
Mammals	184	46
Reptiles	179	110
Amphibians	62	32
Total	770	235

Source: Myers, Norman & al - Biodiversity hotspots for conservation priorities (2000)

The cork oak forests ensure a great natural biodiversity of wild fauna, of which 24 species of reptiles and amphibians (53% of the Portuguese population), more than 160 bird species, and 37 mammal species (60% of Portuguese mammals)[13].
Montados play a crucial role in protecting the most charismatic species, threatened with extinction in the Mediterranean (table 1) and provide a habitat to millions of migratory birds from Northern Europe, including the entire crane population - a species larger than the capped heron (in winter around 45000 birds migrate to the Iberian Peninsula, of which between 2000 and 3000 remain in Portugal during autumn and winter; Source: www.naturlink.pt).

Table 2 - Key examples of threatened species found in Mediterranean montado landscapes, according to the WWF

Species	Estimated Number
Iberian Lynx (Lynx pardinus)	Fewer than 100 (not counting cubs of the year)
Iberian Imperial Eagle (Aquila adalberti)	150 breeding pais
Barbary Deer (Cervus elaphus barbarus)	Found only in North West Tunisia and North East Algeria. No available estimate of number of individuals.

[13] Reis, M. S.; Correia, A. I. "*Caracterização* da *flora* e fauna do *montado* da Herdade de *Ribeira Abaixo"*, Centro de Biologia e Recursos Naturais, Lisboa(1999)

Black Vulture (Aegypius monachus)	1.050 – 1.150 breeding pairs in Spain (based onTucker & Heath – 1994) 800 breeding pairs in Spain (based on Castro & al., 1997)
Black Stork (Cicconia nigra)	A total estimate for Spain of 350-400 breeding pais

Source: ICBN

Million Thousands of other migratory birds choose the montados as an ideal winter habitat. Nightingales, thrushes, chaffinches, woodpeckers and capped herons from Northern Europe are just some examples.
The montado also plays an important role for migratory birds moving to Africa. The majority of birds migrating across the Strait of Gibraltar come from Western Europe, such as storks, kites, vultures, buzzards, booted- and short-toed eagles. For this reason, the Strait of Gibraltar together with the Straits of Messina and Bosphorus are the main crossing points for hundreds of thousands of soaring birds.
The montados close to the Strait of Gibraltar (Los Alcornocales Natural Park, Spain, and Northern Morocco) therefore occupy a strategic position in these movements. From Los Alcornocales Natural Park, in the heart of Andaluzia, over 600.000 birds were observed flying overhead between July and November 2005 (Source: Junta de Andalucía, Consejería de Medioambiente, 2006).
Among the bird species normally found in the montado are kestrels, little owls, southern grey shrikes, black-winged kites, Iberian imperial eagles, black vultures, great spotted cuckoos and black storks, of which there are only 83 - 96 pairs in Portugal.

GREAT SPOTTED CUCKOO

BLACK-WINGED KITE

A number of species of birds of prey also depend on the montado habitats because the forests provide sturdy, tranquil nesting sites, whilst the grasslands are ideal hunting grounds. The scrub areas are often the ideal breeding grounds for prey, such as rabbits.
For example, there is a population of endangered Bonelli's eagles in Portugal (77-80 pairs according to Instituto de Conservação da Natureza e da Biodiversidade) which has adapted to nesting almost solely in cork oak trees. The big, open canopy of the trees provides nesting spots, whilst the tranquillity of the woods is conducive to breeding. The gnarled, holey bark of the tree is a convenient source of insects for feeding.
Southern Portugal also has a small Golden Eagle population, and thriving peregrine falcon and griffon vulture populations in the montados, a semi-perennial home to other threatened species such as the red kite and lesser kestrel.

BONELLI'S EAGLE

SHORT-TOED EAGLE

The IUCN report on threatened wild species showed that there are more rare birds species in Portugal than any other part of Europe.
Some information regarding species found in montados, according to the o Livro Vermelho dos Vertebrados de Portugal (Red Book of Portuguese Vertebrates, 2006):

- Iberian Imperial Eagle (Aquila adalberti): 2 - 5 pairs in Portugal, critically endangered;
- Short-toed Eagle: (Circaetus gallicus): 250 - 600 pairs in Portugal, near threatened;
- Black-winged Kite (Elanus caeruleus): 100 - 150 pairs in Portugal, near threatened, regarded as a Rare Species (BirdLife International 2004).
- Black Stork (Ciconia nigra): 83 - 96 pairs in Portugal, vulnerable, regarded as a depleted species, having suffered a sharp decline over time (BirdLife International 2004);
- Red Kite (Milvus milvus): 50 - 100 pairs in Portugal, critically endangered.

Montados are also rich in mammals, among them hares, weasels, foxes, wolves, genets, wild boar, deer, wildcat, wild rabbits and a few Iberian lynx.

The Iberian Lynx is a species that finds in the cork oak forest the preferential habitat to live. It was considered by IUCN a species critically endangered of extinction, according to its 1990 black list. The Iberian lynx is the most endangered feline species in the world and the most endangered carnivore in Europe.
Studies carried out in March 2005 estimate that the number of surviving Iberian Lynx is only 100, far short of the figure of 400 in the year 2000.
In recent years some organizations have sought to ensure reproduction of the species in captivity, which led to the increasing of the number of species. Some examples of such projects:

- LIFE HABITAT LINCE ABUTRE Project, by the League for Nature Protection (LPN), Portugal (http://habitatlinceabutre.lpn.pt);
- LINCE Program, by the League for Nature Protection (LPN) and Fauna & Flora International (FFI) (http://www.lpn.pt/Homepage/O-que-fazemos/Programas/Programa-Lince/Content.aspx?tabid=2454&code=pt);
- Ex-Situ Program for Conservation of the Iberian Lynx, Andalusia, Spain (www.lynxexsitu.es).

LIFE HABITAT LINCE ABUTRE Program - "Iberian Lynx and Black-Vulture Habitat Promotion in the southeastern of Portugal" - will take 4 years and will be implemented in the regions of Mourão, Moura and Barrancos, Guadiana Valey and Caldeirão Mountain, in Rede Natura 2000 areas already therein. This project aims to contribute to Iberian Lynx and Black-Vulture and their habitats conservation in

Southeastern of Portugal, and will also benefit a wide range of other species typical of the Mediterranean landscape.

LINCE Program was launched in 2004 by League for Nature Protection (LPN), in partnership with the organization Fauna & Flora International (FFI) and that also counts with the technical and scientific support of the main expertizes of this species in Portugal. The main goal of this project is to ensure a long term conservation and management in areas with Mediterranean Habitat, that is suitable for Iberian Lynx in Portugal.

Ex-Situ project involves, among other activities, the reproduction of the Iberian Lynx in captivity, the genetic and demographic management of its population, the management of the Bank of Biological Resources (BRB), the preparation of this species born in captivity for later release in nature, as well as training of professionals, environmental education and awareness.

Iberian Lynx

In addition to these programs it has also been created by the Conservation Institute for Nature and Forest (ICNF) and IBERLINX Association, a cross-border regional action for Iberian Lynx conservation (http://areasprotegidas.icnf.pt/lince/), to improve the habitat of this species, based in the following three goals:

- Adjust the fraction and pattern of shrub coverage of habitats to species' needs;
- Preserve the fraction of coverage with developed scrublands;
- Decrease the risk of fire.

This action aims essentially to stimulate the owners and managers of the lands to do, in an autonomous way, the necessary improvements in the habitats, for that Iberian Lynx could live in a natural environment.

All these projects have registered very positive results, since they allowed the introduction in natural habitat of several Iberian Lynx bred in captivity, from which resulted already the birth of Iberian Lynx in a full natural habitat.
In 2002, when the fixed programs of conservation began, the Iberian Lynx was in “critically endangered" of extinction and was also considered the feline species most threatened in the world. With the good outcomes of the joint conservation program, the classification was reviewed to "threatened" in 2012. The immediate goal is to do another classification and to reach the “vulnerable” level.
Between 2001 and 2015 the Iberian Lynx population of Andalusia – where is concentrated the majority of individuals living in freedom – passed from 100 to 361. And the last reported numbers of early April 2016, disclosed during the V International Seminar on Conservation of the Iberian Lynx, accomplished in

Andalusia University, show that currently there are 403 Iberian Linx in all Iberian Peninsula (http://iberlince2016seminariointernacional.com/port/).

SUSTAINABILITY OF THE MONTADOS

CORK FOREST AND CHAIN OF CUSTODY CERTIFICATION SYSTEMS

Definition of Sustainable Forest Management

Sustainable forest management (SFM) is the term currently used to describe approaches to forest management that set social, economic and environmental goals.
A range of forestry institutions now practice various forms of sustainable forest management and a broad range of methods and tools are available.
A definition of the present day understanding of the term sustainable forest management was developed by the Ministerial Conference on the Protection of Forests in Europe (MCPFE). It defines sustainable forest management as:
"The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions at local, national, and global levels, and that does not cause damage to other ecosystems."
In other words, the concept can be described as the attainment of balance between societies increasing demands for forest products and benefits, and the preservation of forest health and diversity. This balance is critical to the survival of forests and to the prosperity of forest-dependent communities.

Scope of Forestry Standards

For forest managers, sustainably managing a particular forest means integrating a wide array of factors - commercial and non-commercial values, environmental considerations, community needs, even global impact - to produce sound forest plans.
Growing environmental awareness and consumer demand for more socially responsible businesses have increased the demand for products originating from forest certified raw materials. This rise of certification led to the emergence of several different systems throughout the world. As a result, there is no single accepted forest management standard worldwide and each system takes a somewhat different approach in defining standards for sustainable forest management.

Chain of Custody / Third Party Certification

Operations that use certified materials or that purchase and sell certified products can earn Chain-of-Custody (CoC) certification. CoC certification ensures that a product bearing the Certification label can be verified to contain sufficient quantities of certified materials.
Chain-of-Custody certification assures consumers and forest product companies that the products they buy come from certified forests. The certification program, thus, tracks the cork from the certified forests to the point of sale.

Certification Systems

With forest certification, an independent organization develops standards of good forest management and independent auditors issue certificates to forest operations that comply with those standards.
This certification verifies that forests are well-managed — as defined by a particular standard — and ensures that the natural products come from responsibly managed forests.
The most common Cork Certification standards are:

1. Forest Stewardship Council (FSC):

The FSC is an independent, non-profit, non-government organization based in Bonn, Germany, providing standard setting, trademark assurance, and accreditation services for companies and organizations interested in responsible forestry. It was created in 1994 by environmental organizations such as WWF, Friends of the Earth and Greenpeace, indigenous forest dwellers, professional foresters, big retailers such as Sweden's IKEA and the UK's B&Q; and large and small forest companies.
The FSC is active in 100 countries throughout the world, has certified over 183 million hectares of forest and 28 thousand of companies (November 2013).
In Portugal there are around 147 thousand hectares of certified montado, which represents 20% of montado total area and 59 Chain of Custody certificates held by cork companies (2016). In the entire world there are already 519 Chain of Custody certificates in 25 countries.

2. Programme for the Endorsement of Forest Certification schemes (PEFC):

The PEFC was founded in 1999. It is an independent, non-profit, non-governmental organization which promotes sustainably managed forests through independent third party certification. It is based in Luxembourg.
In Portugal PEFC certified already 255.657 hectares of forest, which represents 8% of the national forest total area. The certification of areas with cork oak trees represents 3% of this value, approximately 22 thousand hectares.
Concerning to the Chain of Custody, PEFC has already certified 96 companies/facilities, of which 4 certificates were allocated to entities related to cork and its derivatives (Source: PEFC, 2016).

PROTECTIVE NATIONAL LEGISLATION

National and regional laws in Portugal protect cork oak forests and forbid unauthorized felling of trees. Cork trees can only be cut down if they are dead or diseased and even then only with the written permission of the authorities.
Legislation imposes heavy fines for any damage or improper management of the trees and lays down strict rules governing the stripping and maintenance of trees. These state, for example, that a young tree cannot be stripped until it has reached a minimum of 25 years of age, and that the width of the tree must have reached a diameter of at least 70 cm at a height of 130 cm. They also state that the cork bark cannot be stripped above a height equal to twice the width of the trunk for the first stripping, or a maximum of three times the height for an adult tree in full production.
It is also not permitted to take cork from an adult tree's branches if these are less than 70 cm in diameter. In all cases, it is absolutely forbidden to harvest the cork more frequently than once every 9 years (even if an individual tree is ready for harvesting before this time period).
There are laws governing the tilling of the soil around trees, correct pruning and fines for neglect and mismanagement.
In Portugal, the first laws protecting the cork oak tree date back to the 12th century, and in more recent times a system of rules and regulations has been enforced since 1927. Since then, the laws have been updated and revised frequently. The protection of the trees extends beyond legislation to the local level. Many cork farmers are also members of forestry associations where there are management systems, of which the Code of Silvicultural Practices (Best management practices) is one, promoted and upheld by these organizations and strictly abided by farmers.
Careful management of the forests enables the continued extraction of the cork bark and as a result farmers adhere to the forestry norms wholeheartedly.

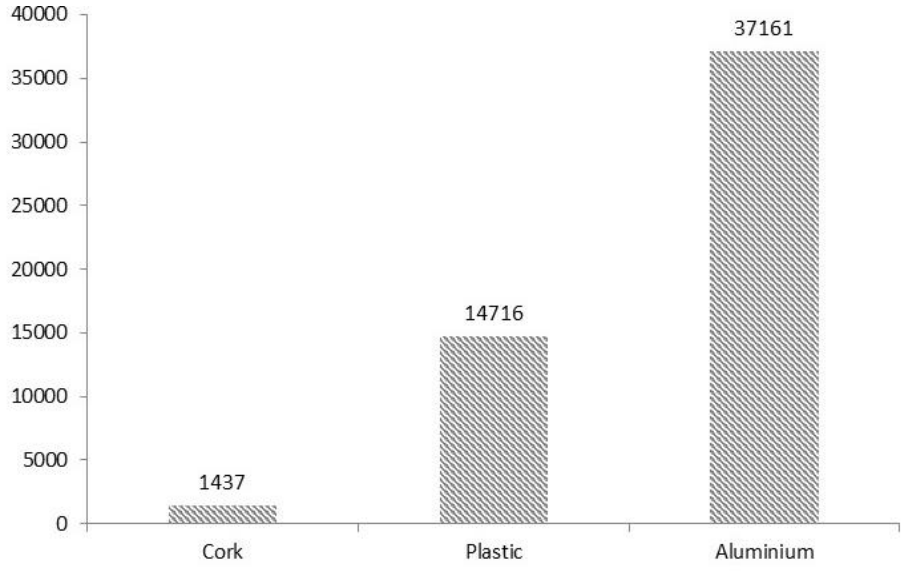
REFORESTATION PROGRAMS

Several reforestation programs have been the drive behind the average 3,3% increase in cork oak forest areas in the last years. Over 130.000 ha (in Portugal and Spain) were planted with a density of approximately 120 to 150 cork trees per hectare. Cork that is being extracted from these trees will used briefly.

SUSTAINABILITY OF CORK INDUSTRY

In the cork industry, the catchphrase "nothing is lost, everything is transformed" applies perfectly. Throughout the entire production process, all waste arising from the production of cork stoppers is transformed into useful, high quality products. From technical and agglomerated stoppers to flooring panels and wall coverings, decorative items for home and office, art and design items, shoe soles, applications in the automotive industry and the military and aerospace industries, chemical products with pharmaceutical uses, among others. Even cork dust is used for co-generation of electricity.
A study by PricewaterhouseCoopers/Ecobilan[14] about the life cycle of cork stoppers compared to aluminium caps and plastic closures showed that cork stoppers possess environmental advantages with regard to alternative closures in the various indicators examined.
With regard to the emission of greenhouse gases, the study reveals that each plastic closure causes 10 times more CO2 than a cork stopper, while the CO2 emissions caused by an aluminium cap are 24 times greater than those caused by a cork stopper.

Chart 1 – CO2 Emissions (g)/1000 closures



Source: PricewaterhouseCoopers/Ecobilan (2008)

These results take into account the fact that each 45x24 cork stopper retains 6,2g of CO2, corresponding to the carbon incorporated into each cork by means of photosynthesis. The impact of each phase of the life cycle is summarized in the following table:

14 PricewaterhouseCoopers/ECOBILAN, "Evaluation of the environmental impacts of Cork Stoppers versus Aluminium and Plastic Closures" (2008)

Table 3 - CO2 emissions impact in closure's manufacturing process

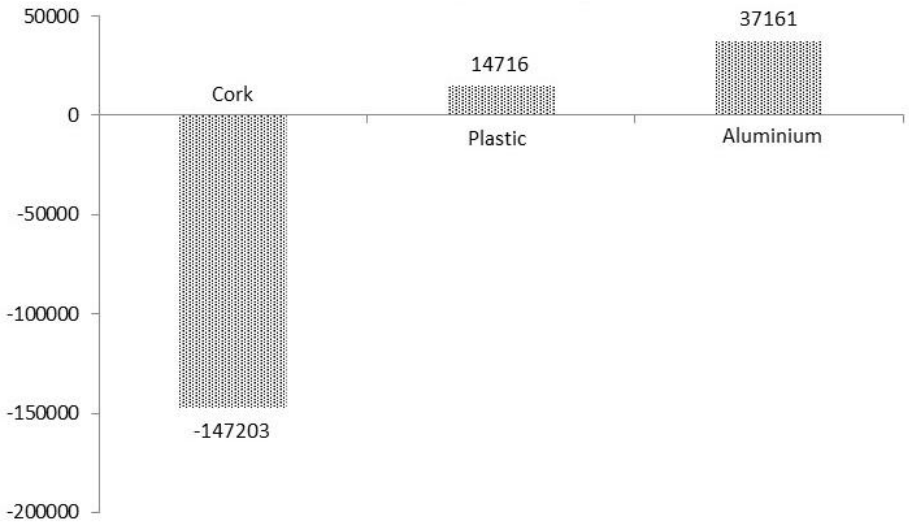
	Cork	Plastic	Aluminium
Production	- 3 280, 5	12 618, 3	36 701, 0
Transport	920, 9	323, 1	439, 4
Bottling	3 272, 3	3 272, 3	0, 0
End of life	524, 0	- 1 497,5	20, 3
Total CO2 Emissions (g/1000 stoppers)	**1 436, 7**	**14 716,2**	**37 160, 7**

Consider only PVC capsules usually used in bottles with cork or capsules closures.

Source: PricewaterhouseCoopers/Ecobilan (2008)

The chart below shows the results when the carbon retention of the montado associated with the use of 3,5g of cork (the weight of each stopper) is factored in.

Chart 2 – Carbon sink per closure



Source: PricewaterhouseCoopers/Ecobilan (2008)

In fact, natural cork stopper is considered, together with all cork oak forest (montado) that depends on it, is able to retain 112g of CO2 per unit.

100% RECYCLED CORK STOPPERS

Cork stoppers can also be recycled and reused. Used stoppers are ground up and used in the production of other agglomerated products, although they may not be reused within the wine industry. There are a number of initiatives throughout the world which have put this idea into practice. The most recent was launched by Quercus, with the Green Cork Project.
Some examples:

Portugal

GREEN CORK - It is a cork stopper recycling program developed by Quercus, in partnership with Amorim, Continente, Dolce Vita, schools, scouts, local councils, waste collection companies, wineries,

winemakers and other entities. The project aims not only to transform used corks into other products but also, through its recycling effort, to fund part of the "Common Forest" program, which aims to plant native forest trees, including cork oaks. Find more information at www.greencork.org.

CORK STOPPER RECYCLING BIN ("Rolhão") - São Brás de Alportel Council, in Algarve, launched an original initiative among its residents, at the start of 2005: it challenged them to dispose of used corks in the cork stopper recycling bin. This bin was specifically designed and prepared for this purpose, and several were strategically spread throughout the municipality beside the usual recycling bins. Even before the creation of the Cork recycling bins, this local council had already implemented the fortnightly collection of cork stoppers from around fifteen restaurants of the region. An initiative aimed at the recovery and recycling of cork stoppers from bottles or demijohns to manufacture a variety of products. The new objects can put on sale, thus helping to raise awareness of the importance of ecological issues in the protection of the environment. http://www.cm-sbras.pt/pt/menu/481/outros-residuos.aspx#rolhao---contentor-castanho.

CORKSCREW ("Saca-Rolhas") - This is the name of a project of the Portuguese Guides Association (AGP), launched in 2005, which aims to collect used cork stoppers and recover them for new uses. AGP had collected 20,000 kg of stoppers by December 2012. What was the purpose? This project has a dual purpose: to contribute to the conservation of the environment, reusing a natural resource – cork, and to cooperate with charity institutions since the sum that results from the sale of the stoppers for new uses is channeled to those charity institutions. How do I take part? Anybody can participate. They just have to contact AGP and ask for a cork recycling bin to be provided, agreeing the delivery place and date. Later on, the Guides replace the bin for a new one and collect the stoppers that have been deposited in the bin. More information at http://www.guiasdeportugal.org/index.php/projetos/rolha.

There are also a number of **international** initiatives:

Spain
RECYCLING CORK, RECYCLES LIFE ("**Reciclas Cortiça, Reciclas Vida**") – This is the name of an initiative that is being implemented in Spain and which aims to collect cork stoppers for later use in manual work for the disabled. The idea is that of the ADISANVI association, in São Vicente de Alcântara, and it has been underway since December 2010. http://reciclascorchoreciclasvida.blogspot.pt/

France
RECYCLAGE – The French Federation of Cork Professionals set up a scheme for the collection of cork stoppers in several French towns. The collected stoppers are sold to companies of the sector to be reused for other products and the funds from the sales are channeled to humanitarian causes or handed over to Institut Méditerranéen du Liège for the planting of new cork oaks.
http://www.planeteliege.com/recyclage.php

ECOBOUCHON – An initiative for the collection and recycling of stoppers backed by Amorim France. It is spread throughout the country. http://www.ecobouchon.com/

Italy
TAPPO A CHI? – The project was first implemented in Florence by Rilegno (consortium for the collection and recycling of wood packaging) and Quadrifoglio (Florence environmental services) who joined forces to set up a scheme for the recycling of cork stoppers in the region. Nevertheless, after the pilot phase Rilegno advanced with various other consortia in other regions of Italy. Legambiente (Associação Ambientalista Italiana) and Amorim Cork Italia are two other entities also involved in the project.
http://www.rilegno.org/cosa-facciamo/progetto-sughero-tappoachi/

ETICO – The Etico project was created by Amorim Italia in Italy. It aims to collect and recycle stoppers in various cities of the country, in partnership with a number of associations linked to various causes. The sums collected from the sale of these stoppers are given to the association for use in the development of its activity. http://www.amorimcorkitalia.com/campagna-etico

USA

RECORK – It is a collection and recycling scheme for cork stoppers in the USA and Canada. The ReCORK programme is sponsored by the Amorim company, in Portugal, by SOLE, a shoemaker, and by the Amorim companies in the USA – Amorim Cork America and Portocork America. The goal is to recycle cork stoppers and educate and inform the public about the critical role of cork oak forests in the fight against climate change and protection of the ecosystem. ReCORK has already collected millions of used corks. SOLE uses the recycled cork stoppers to develop products using this raw material instead of plastic. The stoppers are collected in retailers and restaurants throughout North America. http://recork.org/

CORK RE-HARVEST – The Cork Re-Harvest movement, which has been collecting cork stoppers since 2008, is considered one of the largest of the USA and Canada. In addition to collection, the group's activities include educating the public about the cork oak forest and cork oaks and biodiversity, raising awareness of the threat of extinction faced by the Iberian lynx and Iberian imperial eagle. It is now called, for this reason, the Cork Forest Conservation Alliance (CFCA). It implements campaigns that go beyond recycling, aiming to conserve the cork oak forest and the ecosystems. The partners are Forest Stewardship Council – FSC, European Forest Institute – EFI and the Economic and Social Committee of the United Nations. http://www.corkforest.org/

Australia

CLEAN UP – In Australia, cork stoppers have been collected and recycled by Girl Guides since 1992 Every year they collect more than 30 tons of stoppers from friends, hotels, restaurants, clubs and wineries. The Australians are encouraged to take used cork stoppers to a local "Clean Up site" and leave them in special Guides Australia cork recycling bags. http://www.girlguides.org.au/get-involved/recycling-programs.html

Germany

KORKAMPAGNE – NABU, a German environmental association, runs a cork stopper recycling project which has been implemented in 1000 locations including its own offices, schools and government bodies. The initiative, known as "Korkampagne" aims to collect cork stoppers in Hamburg and donate them to one of the city's main associations for disabled people. This association has a grinding machine and it receives and grinds the stoppers in order to make other cork products. The association aims for a social goal, as well as raising awareness for the conservation of the planet. https://www.nabu.de/umwelt-und-ressourcen/aktionen-und-projekte/korkampagne/

KORKEN FÜR KORK – The Assoziation des Werkstoffs Kork association, which aims to transform the collected stoppers into cork article, is responsible for this initiative. The association was founded in 1991 and it is known as Diakonie Kork. The recycling project has 3 goals, focused on the social and ecological areas: engage local society with the Diakonie Kork association; create jobs for disabled persons; contribute to reducing waste and preserving a material of high value. http://natuerlichkork.de/nachhaltigkeit/korken-fur-kork/

Belgium

RECYCORK – The collection and recycling of cork stoppers began 15 years ago in Belgium, and under the responsibility of the Petit Liège association. Other associations followed its example and recycling

appeared in several cities. In 2011, Petit Liège closed and the social company De Vlaspit decided to continue the project, bringing more professionalism to the idea. The recycled product is sold under the name "Recycork" and more than 900 stopper collection points can be found all over the country. http://www.recycork.be/fr

More information about the environmental importance of the montado at "The Environmental Brochure": http://www.apcor.pt/en/portfolio-posts/the-environmental-brochure/ (available in PT, EN, FR, IT, GER, CN and SP).

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