Synthèses

Grasslands and herbivore production in Europe and effects of common policies

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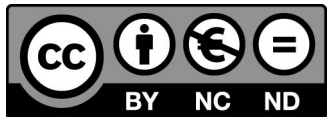

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2 219 639 animals in 2009) and goats (41.6%; 420 711 animals in 2009). This decline in small ruminant numbers has led to greater extensification in rangeland grazing, mainly in the central and northern Portugal mountains. However, this trend cannot be generalised to the montado grasslands.

Grasslands of the wooded parkland of the South of Portugal, the 'montado'

Authors: Jorge Capelo, Carlos Aguiar, I. Seita Coelho

A specific type of grazed wooded parkland, named 'montado' in Portuguese and 'dehesa' in Spanish, attains, in Portugal, over a million hectares according to the 2006 Portuguese Forest Inventory. These are more or less sparsely wooded lands, either of live- or cork-oak (*Quercus rotundifolia* and *Q. suber*, respectively) (Photo 20, Plate CS14) where an extensive agricultural system with fallow land was established from the Middle Ages, with the largest historical expression since the 19th century. A fairly dense mono-specific tree-layer of oaks was inherited from a former dense natural forest that was either burnt or cleared, increasing the proportion of clearings typically to more than 40% of the area, among even-spaced trees. Tree species other than live- or cork-oaks were eliminated, as well as the shrub, climber and herb-layers. Successional evolution to a meta-stable zoo-anthropic permanent grassland developing underneath the canopy was carried out with sheep grazing, fitted in a cereal-based long and low soil disturbance rotation system. Even-spaced Quercus trees produced large quantities of acorns, between 400 and 700 (1000) kg/ha-1, that were used in pig fattening. In addition, such parklands were managed to produce forest products such as cork, charcoal (from tree pruning), game and more recently, wildlife and ecosystem services associated with biodiversity, leisure and aesthetics.

Live-oak parklands are more frequent in the southern half of Portugal, away from the sea, in dry (rainfall ← 500 mm per year) continental (meso-Mediterranean bioclimate) climate areas, either in silicate- (sandstone, granite and schist, excluding loose sands) or limestone-derived soils. Cork-oak parks mainly occur in the littoral half of southern Portugal (Figure CS5), which experiences higher rainfall (→ 500 mm per year) and a hotter and mild frost climate (thermo-Mediterranean and lower meso-Mediterranean bioclimates), in diversified substrata (including pleistocenic loose sands), except in limestone-derived soils. Both systems include high-scrub seral stages (e.g., *Quercus coccifera*, and *Arbutus unedo*) and low shrub stages dominated by *Cistus*, *Ulex* and/or *Erica*. The shrub vegetation is regularly eliminated, in general with heavy disk harrows, as it competes with pasture, increases the risk of wildfire and fosters barking (cork extraction) and tree pruning.

The actual grasslands of the montado system can be broadly categorised into four main types. Among the most frequent species in the Mediterranean *P. bulbosa/T. subterraneum* swards (class *Poetea bulbosae*) are *Astragalus cymbaecarpos*, *Bellis annua* subsp. pl., *B. sylvestris*, *Carex divisa*, *Erodium botrys*, *Hypochaeris radicata*, *Leontodon tuberosus*, *Onobrychis humilis*, *Plantago serraria*, *Poa bulbosa*, *Ranunculus bullatus*, *Trifolium subterraneum* subsp. pl., *T. nigrescens*, *T. suffocatum* and *T. tomentosum*. In pre-industrial pastoral systems, *Poetea bulbosae* grasslands were grazed by large transhumant sheep flocks from the first autumn rains until the end of April or early May. This type of grassland has two biomass productivity maxima, in autumn and in spring, and can achieve 0.75 LU/ha.

Sown permanent *T. subterraneum* grasslands (Photo 21, Plate CS14) are an easy and increasingly important way to restore *Poetea bulbosae* grasslands that can double their original dry matter annual yields if a minimum P fertilisation is applied and management is improved. In case of sowing, other legume species are often used in combination with *T. subterraneum*: *T. michelianum, T. vesiculosum, T. resupinatum, Medicago polymorpha, Biserrula pelecinus* and *Ornithopus compressus*. The late-phenology *Agrostis castellana/ Festuca ampla* (class *Stipo-Agrostietea castellanae*) meadows, adapted to deep soils or wet depressions, are another grassland type dependent on grazing. In general, grasslands with a larger perennial plants component (e.g., *Poa, Agrostis* or *Festuca*) have a higher expression in more continental areas (meso-Mediterranean bioclime). The third grassland type is the oligotrophic poor annual grasslands (class *Helianthemetea guttati*) with *Anthylis lotoides, Brachypodium distachyon, Coronilla repanda, Trifolium angustifolium, T. boconnei, T. cherleri, Plantago belardii, Tuberaria guttata, Ornithopus compressus, O. pinnatus* and *Vulpia* sp. pl. Annual grasslands do not rely on grazing and emerge as a result of tillage, often after nitrogen leaching after a single rainy season. The fourth, and nowadays the most common type of grassland, are semi-nitrogen-prone annual plant communities (order *Thero-Brometalia*). These are, in fact, 'weed' grass dominated communities that consume the mineral nitrogen briefly available after crop harvest, introduced in the system via organic soil matter mineralisation after soil disturbance, or by chemical fertilisers and outsourcing feed. Its most common species are *Bromus tectorum, B. rigidus, B. matritensis, Holcus setiglumis* and *Vulpia alopecurus*.

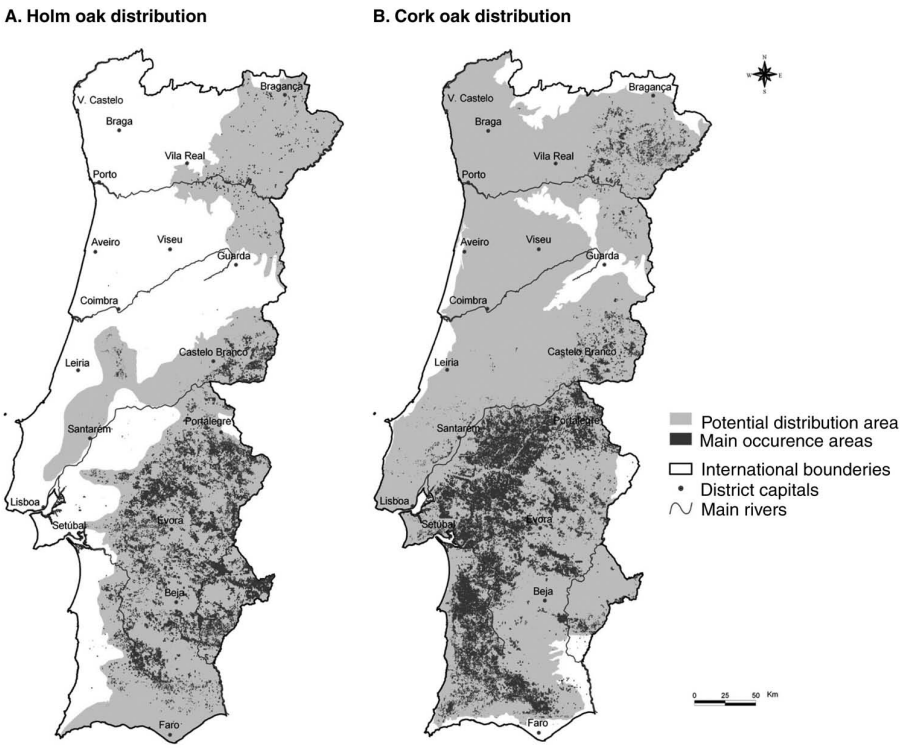

Figure CS5. Distribution of (A) live-oak (*Quercus rotundifolia*) and cork-oak (*Q. suber*) (B) in Continental Portugal.

Source: Capelo J., Catry F. (*In:* J. Sande Silva, ed., Os Montados, Árvores e Florestas de Portugal III, 2007).

In the traditional montado, the superposition of two grazing types occurs. The 'montanheira' consists of the Alentejana pig breed fattening with *Quercus* acorns (Photo 22, Plate CS15). Expansion peaked in the 1960s, vanishing completely ten years later from montado landscapes due the arrival of the African Swine Fever in 1957 and to a sudden reduction in pig fat demand. The montanheira is returning to the montado, this time focused on the production of quality products: it already embraces four Protected Designation of Origin and 19 sausage Protected Geographical Indication labels. With the artificial cereal price policies launched at the end of the 19th century, the wheat campaign of 1929–1937 and agriculture mechanisation, there was a huge retreat of montado grasslands that compelled ovine grazing of cereal stubs and fallows. The intensification of cereal rotations caused significant soil disturbance and led to area reduction of the most valuable grassland types, particularly of the mosaics of *Poa bulbosa/Trifolium subterraneum* swards and *Agrostis castellana/Festuca ampla* grasslands, and to a banalisation of the flora. After four decades of retreat, there was a noteworthy rise in sheep numbers all over Portugal with the adhesion to the EU in 1985. Cereals, on the contrary, underwent a severe decline. The 2002 CAP reform reduced sheep subsidies that have gradually been substituted by cattle subsidies for montado grasslands use. Cattle have a high and negative impact on montado grasslands structure through soil compaction and the nutrient inputs coming from imported feed. Soil compaction promotes temporary wet soil plants (e.g., *Chaetopogon fasciculatus*) and compacted soil plants (e.g., *Plantago coronopus*); nutrient inputs benefit nitrophilous species, among them thistles (e.g., *Galactites tomentosa, Onopordum* sp.pl. or *Carduus* sp.pl.) and the low-nutritive value grass *Stipa capensis*.

Montado systems define a specific type of habitat in the Natura 2000 Network: habitat *6310. More than half of the Portuguese bird populations considered important to natural conservation such as the black-winged kite (*Elanus caeruleus*), the booted eagle (Aq*uila pennata*), the great spotted cuckoo (*Clamator glandarius*) and the Iberian imperial eagle (*Aquila adalberti*)—a vulnerable Iberian and Northern Africa endemic species—depend on the montado. Agri-environmental measures had an encouraging effect on the conservation of this ecosystem. In fact, the 'Extensive Pasture Systems' support, between 1994 and 1992, covered 1582 land owners and 143 509 ha of montado, 64.5% of the measure's support targeted areas in continental Portugal. The live-oak montados support measure reached 1394 landowners and 76 623 ha over the same period. Unfortunately, agri-environmental measures lost importance after the PAC reform of 2002, due to decoupling, payment delays and increased eligibility restrictions.

Mountain grasslands

Authors: Carlos Aguiar, Jaime Pires, Maria Ester Fernández Nuñez, Orlando Rodrigues

For practical purposes, the 700 m contour line is frequently used to differentiate lowlands from mountains in Continental Portugal (Figure CS6). Above 700 m, the climatophilous natural potential forests of *Quercus robur*, *Q. pyrenaica* and/or *Betula celtiberica* are essentially devoid of termophilous plants, and the traditional vineyards/olive tree/wheat Mediterranean agriculture systems are replaced by chestnut/meadows/potato/rye mountain agriculture systems. Defined in this way, mountains occupy 11% of the Portugal continental land surface concentrated in the northern half of the country. With a few exceptions, Portuguese mountains are granitic or schist peneplain stretches dissected by river erosion, pushed up in the Pleistocene, with a temperate climate in the north-west, and a Mediterranean climate towards the south and east. These physiographic characteristics create various grassland spaces: rivers