Synthèses

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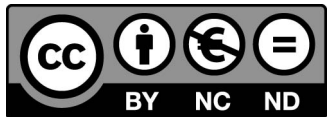

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Contents

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

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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

Figure CS6. Areas above 700 masl in continental Portugal.

headwaters, convex mountain tops and steep valley slopes colonised by oligotrophic rangelands (described above) that, because of extensive grazing and fire promoted lixiviation, were until recently the main source of plant nutrients in valley or gentle slope plateaus meso-eutrophic meadows and agriculture areas.

Mountain meadows are cut once a year, from late June at lower altitudes, to the beginning of August in mountain tops at 1400 m. Traditional hay has a low crude protein content (6%–8%) because farmers have a preference for late cutting dates in order to reduce rain risks during haymaking. After cutting, haymaking meadows are usually grazed with cattle until early spring (middle or end of April). In fertile soils near farmers' homes, recurrent eutrophic summer irrigated meadows are found, which are cut five to eight times a year for green fodder. Meadow management also comprises manual weed uprooting, water channel clearing, wall repair and hedge tree pruning to keep away nitrophilous shade tolerant unpalatable plants (e.g., *Bromus sterilis* and several *Galium, Geranium* and *Torilis* species). Meadows are fertilised by farmyard manure or mineral fertilisers. Irrigation via contour ditches irrigation or wild flooding is used to push productive *Molinio-Arrhenatheretea* grasslands up-slope to the detriment of meso-xerophilous poor grasslands. Winter irrigation known as 'rega de lima' is a common practice designed to reduce late frost effects and start vegetation growth earlier in the season. Annual meadow dry matter yields are highly variable, from about 4 t DM/ha/year in dry *Agrostis castellana/Gaudinia fragilis* meadows, to 14 t DM/ha/year in eutrophic summer irrigated meadows, with 8-10 t DM/ha/year as a reference. Most meadow biomass is fed to beef cattle. In traditional mountain agricultural systems, sheep and goats graze in rangelands.

Meadows are mosaics of herbaceous perennial vegetation (Photo 23, Plate CS15). In the low hemeroby parkland landscapes of the temperate north-western Portugal mountains, these mosaics can include megaforbic shade tolerant communities (class *Galio-Urticetea*), a *Festuca rothmaleri* meadow (alliance *Arrhenatherion*), a mesotrophic species rich meadow dominated by *Holcus lanatus* (alliance *Cynosurion cristati*), a rush community (order

Molinietalia) and a fen (class *Scheuchzerio-Caricetea fuscae*). Relevant regional vascular endemics find their ecological optimum in these mosaics—e.g., *Ceratocapnus claviculata* subsp. picta and the superb *Paradisea lusitanica*—together with other uncommon species at the national scale such as *Arnica montana* subsp. *atlantica* or *Polygonum bistorta*. In Mediterranean mountains, the most diverse meadow mosaics may include a dry *Agrostis castellana/Gaudinia fragilis* grassland (class *Stipo-Agrostietea castellanae*), an *Arrhenatherum elatius* subsp. *bulbosum* meadow (alliance *Arrhenatherion*), a mesotrophic species rich *Holcus lanatus* meadow (alliance *Cynosurion cristati*), one or two rush communities (order *Molinietalia*), and an annual (class *Cardamino hirsutae-Geranietea purpurei*) and at least two perennial (class *Galio-Urticetea*) shade tolerant communities. Threatened species such as *Carex pallescens*, *Euphrasia hirtella, Dactylorhiza purpurea* or *Vicia onobrichioides* can only be found in these complex Mediterranean meadows. Prey (e.g., row deer and wild boar) of the largest Iberian wolf population forage in far-off meadows in the north-eastern Portugal mountain areas. These complex mountain meadows are also an essential habitat component of more than 50% of the rarest Portuguese diurnal butterflies, among them *Brenthis ino, Lycaena hippothoe, Melitaea diamina, Pyrgus alveus, P. serratulae*, and the myrmecophilous *Maculinea alcon*. Five of the fifteen accepted Portuguese cattle breeds have their origin in mountainous regions with large meadow areas.

Dairy and meat sectors linked with mountain meadows have remained quite stable in recent years, although there is a tendency towards declining cattle numbers and dairy cattle being replaced by beef cattle. Simultaneously, over the last ten years (1999–2009) the number of holdings with cattle decreased by about 51%, implying a larger average size of the production units. Production systems have also changed. The waning of rye and potato crop importance following EU adhesion freed up agricultural land for feed crops. Triticale, Italian ryegrass and oat/vetch mixtures are widely cultivated on today's mountain farms. In pre-industrial agricultural systems the number of cattle per holding depended on the available meadow area; today it depends on the existing arable land area. Consequently, remote meadows are being abandoned or planted with trees (e.g., hybrid poplars). Many meadows located close to villages were converted to arable cropping or intensified through irrigation and mineral nutrient use. Unfortunately, for methodological reasons this intensification-extensification trend is difficult to grasp in Portuguese agricultural statistics.

Meadow abandonment is preceded by careless management, recognisable by the invasion of undesirable species like *Brachypodium rupestre, Mentha suaveolens* or nitrophilous shade tolerant species. Sometimes farmers try to control these species with fire and ploughing, leading to impoverished meadow flora. Shrub and tree encroachment is common and occurs very rapidly after abandonment, although is slower in nutrient poor meadows with a high continuous cover of mat forming grasses (e.g., *Agrostis* × *fouilladei*). Intensification reduces phytocenotic and species diversity. While competitors (e.g., *Dactylis glomerata* s.l., *Holcus lanatus*, *Lolium perenne* or *Ranunculus repens*) gain dominance, megaphorbs reliant on late cutting dates and low stature, annual, oligotrophic, xerophitic, fen, wet meadows and fringe plants, and their communities, become less common or extinct.

The EU support under the 'Programme for the Rural Development of Mainland Portugal (2007–2013)', the 'Management of the Integrated Territorial Interventions' measure, and the agri-environmental 'support action for the maintenance of high nature value meadows' are key policy instruments in meadow conservation in Portugal. However, current meadow abandonment trends cannot be overcome without tax policies that encourage an agriculture soil market and greater awareness of the social costs of land abandonment.