



Revisiting the Narrative of Deforestation in Central and Southern Mainland Early Modern Portugal as a ‘Ruined Landscape’: The Case of Shipbuilding in Lisbon

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Abstract

Scholars have largely blamed shipbuilding for maritime expansion for being the main driver of deforestation in early modern Portugal. This article sets out to revisit the origins and reproduction of this narrative by analysing three interconnected elements in a case study of Lisbon’s shipyards. Firstly, it studies the claims of forestry policies from the 1400s to the mid-1600s. Secondly, it addresses Portuguese writers and foresters of the nineteenth century. Thirdly, it surveys the calculations of deforestation rates provided by Portuguese and foreign authors and foresters. Three main conclusions can be drawn: (1) scholars’ arguments that shipbuilding was chiefly responsible for deforestation are based on the claims set out in Portuguese forestry policies, (2) nineteenth-century authors and writers stated multiple causes to explain the significant deforestation in early modern Portugal, and (3) it is very likely that the high deforestation rates that nineteenth- and early twentieth-century authors reported are partially due to shifts in the meaning of ‘woodland’.

I. INTRODUCTION

Today, writers on political ecology feel obliged to cite the ‘typical’ Mediterranean landscape as an example of ‘massive ecological degradation’. Scrub and scattered trees are interpreted, without evidence, as the ‘debased forms of the forest’.¹

This statement, written in 2001, stemmed from the Ruined Landscape or Lost Eden theory proposed by Alfred T. Grove and Oliver Rackham. According to this theory, human groups have been causing an ongoing degradation of nature in the Mediterranean Basin for thousands of years, and the authors identified the roots from which it emerged. During the second half of the eighteenth century, these strands were

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¹ A. T. Grove and O. Rackham, *The Nature of Mediterranean Europe: An Ecological History* (New Haven, 2001), p. 10.

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woven into a scientific theory, popularised by French travellers and authors. In the nineteenth century, the theory of ongoing degradation of the Mediterranean landscape – desertification and soil erosion due to constant forest clearance performed since the times of Ancient Greece at least – was reinforced by the influential work of George Perkins Marsh.²

Other authors, however, have pointed out the positive impact of human-induced changes on the Mediterranean ecosystems. Jacques Blondel has argued that human activity has increased the biodiversity and resilience of the ecosystems through intermediate levels of disturbance.³ He concluded from existing pollen-based evidence that although deforestation has been ongoing, it has not necessarily had a negative effect on ecosystems, as humans have sought to find a balance between agricultural and pastoral activities involving the woodlands. The ‘Sylva-Saltus-Ager’, the management of woodland, pasture, and crop fields in separate areas that dates from the Roman period, and *dehesa-montado*, an agrosylvopastoral system used in Spain and Portugal, have proven to be among the best manmade systems as they are productive, sustainable, and resilient.⁴

Although past decades have witnessed a surge of literature concerning human-nature interactions in early modern Portugal, Grove and Rackham’s opening statement remains largely valid when addressing the ecological impact of imperial shipbuilding at Lisbon’s shipyards on the Portuguese woodlands. Scholars have largely identified shipbuilding – especially the construction of vessels for Portuguese maritime expansion – as the main driver of deforestation in early modern Portugal. This narrative has been repeated constantly by authors over the last sixty years, with very few exceptions. Two main issues have been under discussion: (1) the timing of forest destruction and (2) the rates or intensity of deforestation. This section will briefly survey the state of the art concerning the ecological impact of imperial shipbuilding on the woodlands located in mainland Central and South Portugal because the timber used for imperial shipbuilding in Lisbon’s shipyards came mainly from these spaces.

Essays by Frédéric Mauro, Leonor Freire Costa, and Koldo Trapaga Monchet have unravelled the provenance of the timber used to build ships for imperial maritime warfare during the 1500s and 1600s.⁵ These essays and the existing nautical archaeological records show that these ships were

² *Ibid.*, pp. 9–11.

³ J. Blondel, ‘The ‘Design’ of Mediterranean landscapes: A Millennial story of humans and ecological systems during the historic period’, *Human Ecology*, 34 (2006), pp. 713–29, at pp. 713–14.

⁴ *Ibid.*, pp. 720–23.

⁵ L. Costa, *Naus e galeões na ribeira de Lisboa. A construção naval no século XVI para a Rota do Cabo* (Cascais, 1997), pp. 308–25; F. Mauro, *Le Portugal, Le Brésil et l’Atlantique au XVIIe siècle (1570–1670)* (Paris, 1983), pp. 129–35; K. Trapaga Monchet, ‘No es madera para vasallos, sino del rey. Las políticas forestales de los Habsburgo en Portugal (1609–1640)’, *Obradoiro de Historia Moderna*, 28 (2019), pp. 116–30.

constructed out of cork oaks (*Quercus suber*), stone pine (*Pinus pinea*), and maritime pine (*Pinus pinaster*) from an area stretching from Leiria to Alcácer do Sal. This article will consider the area of mainland Portugal that supplied timber for shipbuilding to the shipyards of Lisbon during the 1500s and 1600s within the framework of the Ruined Landscape or Lost Eden theory of the Mediterranean region.

Most historians have followed in the footsteps of Charles R. Boxer, who pointed out the challenge of finding high-quality timber for shipbuilding by the mid-sixteenth century was partially due to the lack of adequate infrastructures for the transportation of timbers to the shipyards.⁶ James Duffy stated in the 1950s that the ships constructed in Portuguese India were of higher quality due to the superiority of Indian woods.⁷ Frédéric Mauro reported a lack of suitable timber for shipbuilding in Portugal by the first half of the sixteenth century.⁸

During the 1980s and 1990s, knowledge of the history of the Portuguese woodlands experienced a significant leap forward. From the perspective of historical geography, Nicole Devy-Vareta's essays deserve a special mention. She set out to unravel the evolution of the spatial distribution of the woodlands and their human and natural conservation, as well as processes of deforestation from approximately the late 1200s to the early 1600s. The author concluded that there was a mismatch between woodlands' capacity for natural regeneration and the strain posed by societies, especially the trade and industrial sectors. As a result, the Portuguese woodlands were already in crisis during the fifteenth century, and shipbuilding for maritime expansion merely aggravated the pressure on forest resources.⁹ In the 2000s, Nicole Devy-Vareta stated there was a shortage of suitable timber throughout sixteenth-century Portugal. She argued that the existence of abundant legislation on forest protection and the development of the international wood trade were evidence of the deforestation process.¹⁰ Leonor Costa, instead, addressed the economic and maritime history of the trade route that connected Lisbon with Portuguese India during the 1500s. She noted a reduction of the lifetime

⁶ C. R. Boxer, *The Portuguese Seaborne Empire (1415–1825)* (London, 1977), pp. 56, 209.

⁷ J. Duffy, *Shipwreck and Empire. Being an Account of Portuguese Maritime Disasters in a Century of Decline* (Harvard, 1955), pp. 52–63.

⁸ F. Mauro, 'Types de Navires et constructions navales dans l'atlantique portugais aux XVI et XVII siècles', *Revue d'Histoire Moderne et Contemporaine*, 6/3 (1959), pp. 181–209, at p. 200.

⁹ N. Devy-Vareta, 'Para uma geografia histórica da floresta portuguesa. As matas medievais e a «Coutada velha» do Rei', *Revista da Faculdade de Letras – Geografia*, 1 (1985), pp. 47–67; N. Devy-Vareta, 'Para uma geografia histórica da floresta portuguesa. Do Declínio das matas medievais à política florestal do Renascimento (séc. XV e XVI)', *Revista da Faculdade de Letras – Geografia*, 1/1 (1986), pp. 5–37, at pp. 5–14, 28–37.

¹⁰ N. Devy-Vareta, 'Fomento e ordenamento florestal nas regioes litorais durante a Época Moderna', in Inês Amorim, Amélia Polónia and Maria Helena Osswald (coords.), *O Litoral em perspectiva histórica (Séc. XVI a XVIII)* (Porto, 2002), pp. 165–76, at pp. 172–3; N. Devy-Vareta and A. Alves, 'Os avanços e os recuos da floresta em Portugal – da Idade Média ao Liberalismo', in Joaquim Silva, coord., *Floresta e sociedade. Uma história em comum* (Lisbon, 2007), pp. 55–76.

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of the ships covering this route due to the use of *madeiras verdes* ('green woods': unseasoned timbers or from young trees).¹¹

The idea of forest destruction in early modern Portugal transcended the humanities and became a predominant topic of nautical archaeology and ecology. Concerning the former, the surviving remains of an early seventeenth-century ocean-going ship (*Nossa Senhora das Virtudes*) prove that it was constructed from cork oaks, and maritime and stone pines. This material evidence suggests that the timber components of pines were of sufficient quality, though the components made of cork oaks (frames, keel) were not only of low quality but also reflected a poor or non-existent management of cork oaks.¹²

In a multidisciplinary paper that combined the existing literature on paleoecology, archaeology, history, cartography of agriculture and forestry, as well as travellers' and naturalists' writings, Bruno Pinto, Carlos Aguiar, and Maria Partidário compiled an ecological history of Northern Portugal (an area that lies within the Atlantic climate zone with Mediterranean influence) during the Holocene, our current geological epoch, within the framework of the Ruined Landscape or Lost Eden theory. The authors analysed the evolution of the interaction between Mediterranean ecosystems and humans by paying attention to the evolution of the fauna and flora and, in a second phase, related it to what happened in other Mediterranean areas within the aforementioned framework. The authors claimed that during the last 5000 years, the human-induced impact has characterised the fauna and flora changes, basing their arguments on the loss of ecological function. They concluded that despite such a loss, 'the high resilience of ecosystems has enabled their sustainability over eight millennia and has allowed a recovery of the vegetation and fauna during recent decades'.¹³ Mediterranean ecosystems – such as North Portugal – are characterised by a high level of resilience due to 'positive and negative feedbacks between human actions and natural systems', linking with the argument of Blondel.¹⁴

The main shortcomings of this contribution lie in the absence of short-time analyses, the failure to address the impact of shipbuilding on the landscape, and the lack of historical archival materials. The authors suggest that the increasing importation of woods from abroad during the thirteenth century was most likely due to a progressive scarcity of forests, as well to changes in forest uses and new restrictions. They regard the complaints of illegal cuttings during the 1400s in the woodlands belonging to monasteries in Oporto as further evidence of deforestation. Deforestation continued from the 1400s to the 1700s, with shipbuilding

¹¹ Costa, *Naus e galeões*, pp. 191–2, 307–33.

¹² There is no possibility to discuss whether the cork oak timbers were of low quality, but it might be possible to cast doubts about the absence of management. Castro, 'The Pepper Wreck', pp. 11–14; Castro, *The Pepper Wreck*, pp. 108–41.

¹³ Bruno Pinto, Carlos Aguiar and Maria Partidário, 'Brief historical ecology of northern Portugal during the Holocene', *Environment and History*, 16/1 (2010), pp. 3–42. The citation is on p. 30.

¹⁴ *Ibid.*, p. 29.

playing an important but secondary role in the process.¹⁵ However, they correctly state that to understand the evolution of the forest cover, it is paramount to consider the patterns of population growth and land use of agro-pastoral activities from the eleventh century.¹⁶

Although Blondel has emphasised the positive (or not merely negative) impact of humans on the making of Mediterranean landscapes, he and James Aronson also identified the imperial shipbuilding of the Iberian Empires as a driver of forest depletion in the early modern Iberian Peninsula.¹⁷ This shows how deeply ingrained the idea of the negative impact of shipbuilding on the early modern Iberian woodlands is in academia (as well as among the general public). From an ecology perspective, Fernando Reboredo and João Pais shed new light on the history of the forest cover of Portugal by addressing the ecological impact of shipbuilding. According to them, this industry undoubtedly became the main driver of forest destruction, leading to the virtual disappearance of all oak (*Quercus*) forests between the Douro and Tagus rivers. They again consider the overabundance of forest legislation to be hard evidence of an ecological problem (deforestation). Moreover, these authors blindly follow the calculations provided by nineteenth-century authors.¹⁸ It is very likely that these authors might have underestimated the capacity (measured as a percentage of wooded areas) of early modern Portuguese administrations to conserve (and promote) the woodlands. Although Reboredo and Pais positively contributed to the field, the main flaw of their research is the absence of archival sources or a critical approach to the calculations performed by nineteenth-century authors, who played a key role in shaping the idea of a Portuguese Ruined Landscape caused by imperial shipbuilding. Over the past few years, some historians have contested this deforestation narrative by unravelling the history of the woodlands through slow and ongoing archival work. Cristina Joanaz de Melo was probably the first author to address the royal forests of Portugal during the eighteenth and nineteenth centuries in connection with hunting and, to a lesser extent, shipbuilding from the field of environmental history.¹⁹ Koldo Trapaga Monchet's studies, in contrast, have revolved around the uses and conservation of the royal forests and Portuguese woodlands for imperial shipbuilding mainly from 1580 to 1640.²⁰ The

¹⁵ *Ibid.*, pp. 20–23.

¹⁶ *Ibid.*, pp. 18–20, 29.

¹⁷ Blondel and Aronson, *Biology and Wildlife*, p. 202.

¹⁸ F. Reboredo and J. Pais, 'A construção naval e a destruição do coberto florestal em Portugal – Do Século XII ao Século XX', *Ecologi@*, 4 (2012), pp. 31–42, at pp. 36–41; F. Reboredo and J. Pais, 'Evolution of forest cover in Portugal: From the Miocene to the present', in Fernando Reboredo (ed.), *Forest Context and Policies in Portugal: Present and Future Challenges* (New York, 2014), pp. 1–39, at pp. 12–19; F. Reboredo and J. Pais, 'Evolution of forest cover in Portugal: A review of the 12–20th centuries', *Journal of Forestry Research*, 25/2 (2014), pp. 249–56, at pp. 251–5.

¹⁹ C. Joanaz de Melo, *Coutadas Reais (1777–1824). Privilégio, Poder, Gestao e Conflito* (Lisbon, 2000); Cristina Joanaz de Melo, *An Analysis of the Royal Preserves in Portugal. Issues of Privilege, Power, Management and Conflict* (Sheffield, 2016).

²⁰ K. Trapaga Monchet, 'Guerra y deforestación en el reino de Portugal (siglos XVI–XVII)', *Tiempos Modernos. Revista electrónica de Historia Moderna*, 39/2 (2019), pp. 401–25; K. Trapaga-Monchet, 'A

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cooperation between these two authors and other colleagues resulted in the publication of a research volume that directly tackled the impact of shipbuilding on forestry policies, as well on the landscapes of the Iberian Peninsula from the 1200s to the 1800s.²¹

While these scholars have mainly confined themselves to qualitative approaches, others have looked at the question of deforestation quantitatively. As early as the 1930s, António Pinto made numerical calculations on the capacity of the pinewoods of Leiria to meet the timber needs of the Portuguese fleets, at the same time stressing deforestation as an ecological reality in early modern Portugal.²² Raúl Romero-Calcerrada and Koldo Trapaga-Monchet have provided quantitative calculations on the impact of shipbuilding by combining an interdisciplinary approach (cartography, GIS, geography, and history) that compared the capability of Portuguese land to produce timber with the demands of Lisbon's shipbuilding industry. Briefly, the preliminary results show that the Portuguese woodlands were largely capable of supplying the cork oaks, maritime, and stone pine required by city's shipyards.²³

Consequently, as it is very likely that the Portuguese woodlands would have met the Lisbon shipyards' timber needs during the early modern period, the main goal of this article is to address the factors that have contributed to the construction and reproduction of the narrative of deforestation caused by imperial shipbuilding in early modern Portugal. The first part of the article analyses forestry legislation and Portuguese State forestry from the fourteenth to the seventeenth century, as scholars have largely relied on claims expressed in Portuguese forestry to underpin their narratives of early modern Portuguese deforestation. The second part of the article examines the rates of deforestation in early modern Portugal and the first two thirds of the nineteenth century – before the appearance of reliable quantitative data for mainland Portugal – by scrutinising two documentary corpuses: firstly, Portuguese foresters and

destruction that preserves': Maritime warfare, empirical forestry and sustainability in Portugal (13th–17th centuries)', in Koldo Trapaga-Monchet, Álvaro Aragón-Ruano, Cristina Joanaz de Melo (eds), 2023, *Roots of Sustainability in the Iberian Empires: Shipbuilding and Forestry (14th–19th centuries)* (New York-Oxford, 2023), pp. 183–208.

²¹ See especially the introduction with an updated review of the literature on the narratives of deforestation, K. Trapaga-Monchet, Á. Aragón-Ruano and C. Joanaz de Melo, 'The game of the demiurge in the garden of Chronos: Woods play hide-and-seek in the long run through sustainable management, in Koldo Trapaga-Monchet, Álvaro Aragón-Ruano, Cristina Joanaz de Melo (eds), *Roots of Sustainability in the Iberian Empires: Shipbuilding and Forestry (14th–19th centuries)* (London, 2023), pp. 1–30, at pp. 6–15.

²² A. Pinto, *O Pinhal do Rei - Subsídios* (Alcobaça, 1938), I, pp. 147–8.

²³ R. Romero-Calcerrada and K. Trapaga Monchet, 'La ley del alcornoque y la ordenanza del Monteiro-mor de 1605: Cartografía y disponibilidad de recursos forestales, in Koldo Trapaga Monchet and Luis Alberto Polo Romero (eds), *Historia, Sociedad y Medio Ambiente. La sostenibilidad* (Madrid, 2022), pp. 143–80; R. Romero-Calcerrada and K. Trapaga-Monchet, 'Sustainability assessment of forest resources in the geographical area of application of the 1546 Cork Oak Law', in Koldo Trapaga-Monchet, Álvaro Aragón-Ruano and Cristina Joanaz de Melo (eds), *Roots of Sustainability in the Iberian Empires: Shipbuilding and Forestry (14th–19th centuries)* (New York-Oxford, 2023), pp. 209–26.

writers of the nineteenth and first half of the twentieth centuries; and secondly, foreign foresters and writers from the Enlightenment to the early twentieth century. The last part of the article aims to shed fresh light on the effectiveness of early modern forestry policies by revisiting cork oak forestry from the perspective of agroforestry studies.

II. EARLY MODERN FORESTRY LEGISLATION

Analysing early modern European legislation to address the first claims of forest destruction is by no means new. Among others, in 2001, to contextualise his study of the woodlands of early modern Gipuzkoa, Alvaro Aragón Ruano briefly reviewed the literature on the sudden appearance of claims of wood shortages in Europe in the first half of the sixteenth century.²⁴ A few years later, Paul Warde conducted more thorough research on the emergence of these claims in Europe during the first half of the sixteenth century.²⁵ Karl Appuhn unravelled the origins of the discourse of forest destruction for early modern Venice.²⁶ The existing literature on Portugal, unfortunately, has not hitherto addressed the abrupt appearance of these claims of wood shortage and forest depletion.²⁷ Therefore, this section briefly examines the origins and reproduction of the claims of wood shortage in Portuguese forestry policies by merging existing literature with archival sources, with special mention of the seven volumes of *História florestal* edited by Carlos Baeta Neves.²⁸

The research carried out on the forestry legislation drawn up on behalf of the crown for the royal forests and the woodlands of Portugal during the 1300s and 1400s does not contain a single reference to wood shortages or forest depletion.²⁹ Nevertheless, the first reference to the protection of a specific tree species dated back to July 1310, when the king D. Dinis I (1279–1325) ordered the protection of the cork oaks and other unmentioned species located in the Campo de Ourique area.³⁰ The municipality of Ourique is in Alentejo, a region dominated by the *montado* system, to which we will return later (Section IV). The ordinance

²⁴ Á. Aragón Ruano, *El bosque guipuzcoano en la Edad Moderna: Aprovechamiento, ordenamiento legal y conflictividad* (San Sebastián-Donostia, 2001), pp. 21–6.

²⁵ P. Warde, 'Fear of wood shortage and the reality of the woodland in Europe, c. 1450–1850', *History Workshop Journal*, 62 (2006), pp. 28–57, at pp. 30–37.

²⁶ K. Appuhn, *A Forests on the Sea: Environmental Expertise in Renaissance Venice* (Baltimore, 2009), pp. 1–8, 248–52.

²⁷ Devy-Vareta, 'Para uma geografia', 1985, pp. 47–67 and 'Para uma geografia', 1986, pp. 5–36; C. Joanaz de Melo, 'Menos coutadas melhores pinhais: império, inundações, fisiocracia, guerra e especialização das matas reais em Portugal (1777–1824)' *Tiempos Modernos. Revista electrónica de Historia Moderna*, 39/2 (2019), pp. 456–87; K. Trapaga Monchet, 'El estudio de los bosques reales a través de la legislación forestal en las dinastías Avis, Habsburgo y Braganza (c. 1435–1650)' *Philostrato: revista de Historia y arte*, 1 (2017), pp. 5–27.

²⁸ C. Neves, *História Florestal, agrícola e cinegética. Coleção de documentos existentes no Arquivo Nacional da Torre do Tombo* (Lisbon, 1980–1993), 6 vols.

²⁹ Neves, *História Florestal*, vols. I–IV.

³⁰ Neves, *História Florestal*, vol. I, pp. 54–55.

of the *guarda-mor* (chief warden) of the pinewood of Leiria issued in 1524 was designed to conserve the pinewood of Leiria mainly for shipbuilding. However, this law did not make any mention of the scarcity of timber for shipbuilding, or of the destruction of the woodlands.³¹

The term destruction began to be widely used in Portuguese state forestry policies in the 1530s. To mention but a few cases, in 1536, don António de Gama was accorded a privilege whereby nobody was permitted to remove pines from his pinewood located in Aldeia Galega.³² Slaves and people of low social status had damaged the pinewood to such a degree that it was highly challenging to find sturdy timber for shipbuilding.³³ In March 1537, the crown granted the legal status of forest to a woodland of the monastery of Seiça (Montemor-o-Velho) that contained very old timber and trees.³⁴ In July 1538, King João III (1521–57) granted the monastery of Lorvão (Lorvão, Coimbra) permission to establish a forest in the woodland of Ribeira d’Arcos to cater to the monastery’s sizeable needs of firewood and timber for works.³⁵

The last two royal orders expressly targeted the large trees used for construction works, it being very unlikely that the crown would harvest timber for shipbuilding from any of the monasteries’ woodlands. Among other reasons, they were too far away from the shipyards and transportation would be costly. Nevertheless, these specifications on protecting large (old) trees might have paved the way for the laws protecting the type of trees required for shipbuilding, which became strategic from the standpoint of the crown. In 1546, the law on cork oaks was passed, which established a protection area of 60 kilometres along both banks of the Tagus river from Lisbon to Abrantes where it was thoroughly prohibited to cut cork oaks from the base, as well to produce charcoal and ashes.³⁶ Devy-Vareta interpreted this law as ecological evidence of the destruction of the cork oaks, which were ‘doomed’ by the mid-sixteenth century.³⁷

Despite this interpretation, the law of 1546 did not make any claims about the destruction or shortage of the cork oaks. This changed during the 1550s and 1560s. In August 1559, the crown banned the establishment of sugarcane plantations in the surroundings of Lisbon because the sugar refining process required large amounts of pines.³⁸ According to the law,

³¹ Biblioteca da Faculdade de Direito da Universidade de Lisboa (hereafter BFDUL), Ms. 2-12-6. Conversely, Nicole Devy-Vareta noted that by 1513 the pinewoods of Leiria and Pederneira were in poor condition, Devy-Vareta, ‘Para uma geografia’, 1986, p. 28.

³² It refers to Montijo, which is located on the left bank of the Tagus river from where the crown had harvested timber for shipbuilding since at least the sixteenth century, Costa, *Naus e galeões*, pp. 310–15.

³³ Neves, *História Florestal*, vol. V/II, pp. 134–5, also mentioned in Costa, *Naus e galeões*, p. 315.

³⁴ Neves, *História Florestal*, vol. V/II, p. 138.

³⁵ *Ibid.*, vol. V/II, pp. 143–4.

³⁶ D. Nunes de Leão, *Leis Extravagantes* (Lisbon, 1569), Parte IV, Título 17, Lei XI.

³⁷ Devy-Vareta, ‘Para uma geografia’, 1986, p. 30.

³⁸ It is still unknown if the Portuguese crown had passed this law after the experience of Madeira Island. For the impact of sugarcane in Madeira, see J.W. Moore, ‘Madeira, sugar, and the conquest

the overconsumption of pines had led to the destruction of the pinewoods of Ribatejo, which were of great importance to the Lisbon shipbuilding industry.³⁹ In April 1564, the law on cork oaks was replicated for both margins of the Sado river from Setúbal to Alcácer do Sal. The preamble stated the major damage caused by cutting cork oaks to produce ashes, charcoal, and other activities that are not specified. The area of cork oaks had decreased to such an extent that it was very challenging to find mature cork oak trees to build the galleys used to protect the kingdom of Algarve.⁴⁰

It was also around the mid-sixteenth century that the Spanish Crown began making claims about the shortage of timber as a pretext for extending new forestry policies for imperial shipbuilding to properties not belonging to the Crown. These policies, therefore, stemmed from the Crown's aims to achieve greater centralisation in the control and, especially, allocation of forest resources.⁴¹ As the same applied to the cases of Württemberg, Venice, France⁴², and other European geographical areas, Paul Warde's assumption is correct: the adoption of new regulations 'mirrored a process by which the state became much more deeply involved in regulating all kind of resources'.⁴³ However, it is worth noting that this trend did not arise out of nothing during the first half of the sixteenth century. It was very likely part of a process that dated back to the thirteenth and fourteenth centuries when the sovereigns (power) of Mediterranean Europe began to regulate private issues in a shift from the plurality of laws towards states' exclusive lawmaking authority.⁴⁴ Concerning Portugal, from the fourteenth century (if not earlier) onwards, the Portuguese monarchs began using legislation as an instrument of their 'absolute power'.⁴⁵ Within this framework, it is understandable that the Portuguese kings would have claimed that the destruction of the woodlands was causing wood or timber shortages as a political strategy for facilitating the implementation of laws in areas that had not previously concerned them.

The so-called law on trees (*lei das árvores*) of 1565 was the first forestry law on planting that encompassed the whole of mainland Portugal. It stemmed from the scarcity of firewood and wood for houses, ovens,

of nature in the "first" sixteenth century: Part I: From "Island of Timber" to Sugar Revolution, 1420–1506', *Review*, 32/4 (2009), pp. 345–90; J.W. Moore, 'Madeira, sugar, and the conquest of nature in the "first" sixteenth century, part II: From regional crisis to commodity frontier, 1506–1530', *Review*, 33/1 (2010), pp. 1–24.

³⁹ A. de Oliveira, 'Para a história do repovoamento florestal de Coimbra no século XVI', *Arquivo Coimbrão*, XXI–XXII (1967), pp. 5–35, at p. 10.

⁴⁰ Neves, *História florestal*, vol. VI, pp. 44–45.

⁴¹ See J. Wing, *Roots of Empire: State Formation and the Politics of Timber Access in Early Modern Spain* (Leiden, 2015).

⁴² There is a very large body of literature on the case of France, especially studied from the well-known law of Colbert, Paul W. Bamford, *Forests and French Sea Power 1660–1789* (Toronto, 1956).

⁴³ Warde, 'Fear of wood', pp. 42–43.

⁴⁴ P. Grossi, *El orden jurídico medieval* (Madrid, 1996), pp. 62–63, 142, 221–4.

⁴⁵ A.M. Hespanha, *As vésperas do Leviathan. Instituições e poder político. Portugal (séc. XVII)* (Lisbon, 1987), vol. 1, pp. 363–84.

farm implements, and shipbuilding. All the municipalities of mainland Portugal were ordered to plant pines or, failing that, chestnuts, or whichever tree species was suitable to grow in those lands.⁴⁶ During the following decades, at least until the end of the seventeenth century, forestry policies – especially those related to imperial shipbuilding – constantly reproduced the claims of wood shortages or destruction of the woodlands.⁴⁷ Scholars of early modern Portugal have largely repeated the claims contained in early modern forestry policies without questioning whether they were based on ecological evidence.⁴⁸

III. DEFORESTATION RATES DURING THE EARLY MODERN AGE AND PRIOR TO THE RELIABLE QUANTITATIVE SURVEYS OF THE 1870S

There is no doubt that it is highly challenging (if not impossible) to accurately assess the area of forest cover in Portugal prior to the late nineteenth century. Although some scholars have investigated the calculations performed by authors and foresters during the nineteenth and early twentieth centuries, there is a major gap in the underlying reasons why those authors reported a decrease in forest cover during early modern Portugal without providing any documentary evidence.⁴⁹ The following section argues that (1) nineteenth-century and early twentieth-century authors deliberately underestimated the policies and management of early modern forestry in order to justify the new forestry policies adopted by the emerging national liberal states from the 1860s and (2) the incredibly high rates of deforestation reported in the first half of the nineteenth century (prior to 1878 when the first reliable quantitative surveys were conducted) are partially due to a shift in the concept of what a woodland is, which was reflected in the terminology employed by the scientific foresters of Portugal and by foreign writers.

When it comes to the history of the Portuguese woodlands in the modern era, scholars have drawn a distinction between the Early Modern Period and the scientific forestry promoted by the liberal nation-states from the 1860s and 1870s onwards. For instance, Radich and Alves address the history of woodlands from the early nineteenth to the late twentieth centuries, but with a special focus on what occurred after 1878. Their starting point is a calculation of the wooded area of Portugal during the first three quarters of the nineteenth century by looking at the data provided by contemporary authors without questioning the underlying motives for providing, in our view, very low wooded area

⁴⁶ Biblioteca Nacional de Portugal (hereafter BNP), res-90-37a; Devy-Vareta, 'Para uma Geografia', 1986, pp. 28–30; Oliveira, 'Para a história', p. 10.

⁴⁷ Trapaga Monchet, 'A destruction that preserves', pp. 185–203.

⁴⁸ See the introduction of this article for a brief state-of-art.

⁴⁹ M. Radich and A. Alves, *Dois séculos da Floresta em Portugal* (Lisbon, 2000), pp. 35–49; Reboredo and Pais, 'Evolution of forest cover', p. 252.

figures. The 1860s and 1870s saw a disruption or break between modern scientific forestry and traditional early modern forestry.⁵⁰ In 2005, Radich and Baptista focused on the Portuguese woodlands from 1875 to 1938. Gerardo A. Pery's essay *Geographia e estatística geral de Portugal e colónias* (1875) underpinned the assessment studies made of the evolution of forest cover in Portugal.⁵¹ Reboredo and Pais drew on nineteenth- and early twentieth-century authors as well as contemporary scholars to calculate the area of forest cover in mainland Portugal.⁵² They even provided their own calculations estimating deforestation rates 'between 1636 and 1854 of 72.6% and 96% respectively'.⁵³

Consequently, this section provides an overview of the arguments used by nineteenth- and early twentieth-century writers to explain the small rates of forest cover in Portugal prior to the 1870s. José Bonifacio de Andrada e Silva's well-known essay on the need to perform plantings of pinewoods in Portugal was published in 1815. Silva concluded that deforestation had reached its highest peak during the eighteenth-century due to two main types of causes: (1) inevitable causes and (2) avoidable causes. Each of them includes three different variables. Among the avoidable causes were (i) the ignorance or negligence of the staff entrusted with protecting the woodlands; (ii) careless cutting and pruning of the trees and outside the recommended times; and (iii) the lack of an administrative staff committed to preserving the woodlands and royal forests, especially the protection of the trees in *baldios e maninhos públicos* (common lands and uncultivated brushes). However, the main issue was the absence of a truly centralised forestry administration that encompassed mines, woodlands, rivers, and roads because they are interrelated elements. The kings of Portugal had been issuing thoughtful laws for centuries, but they had not been implemented. The solution, therefore, lay in establishing a single, centralised administration backed by the state. This administrative staff would merge the new scientific principles with the worthy empirical experience handed down over the centuries. They would be responsible for enforcing the new regulations that would adjust both to the needs of the state and to local socio-ecological realities, with the ultimate goal of achieving a wooded area of 10% for Portugal.⁵⁴

In 1836, Varnhagen estimated that Portugal's total wooded area accounted for 10% if all the dispersed woodlands and trees were gathered in a continuous surface. This assessment is surprising considering

⁵⁰ Radich and Alves, *Dois séculos da Floresta*, pp. 40–49.

⁵¹ Radich and Alves, *Dois séculos da Floresta*, pp. 35–44; M. Radich and F. Oliveira, 'Floresta e Sociedade: Um percurso (1875–2005)', *Silva Lusitana*, 13/2 (2005), pp. 143–57, at pp. 145–7.

⁵² C. Ribeiro and N. Delgado, *Relatório acerca da arborização geral do Paiz, apresentado a Sua Excelência o Ministro das Obras Publicas, Commercio e Industria* (Lisbon, 1868); B.E. Fernow, *History of Forestry in Europe, the United States and Other Countries* (Toronto, 1911).

⁵³ The quote in Reboredo and Pais, 'Evolution of forest cover', p. 252.

⁵⁴ J. Bonifacio e Silva, *Memoria sobre a necessidade e utilidades do plantio de novos bosques em Portugal* (Lisbon, 1815), pp. 17–20.

that for decades he was the head of the Leiria pinewoods and the Portuguese national woodlands in the first half of the nineteenth century. He considered the production of *carvão* (charcoal) instead of *lenha* (firewood) or *cepa* (stumps) to be the main driver of forest regressions because it entailed stripping the bark off cork oaks and oaks, leading to their death. Moreover, he proposed the pinewoods – especially that of Leiria – managed by the royal navy as spaces in which good policy practices had been implemented. He argued that the experience acquired through empiricism had provided foresters of the pinewood with expertise on various matters, such as when and how to plant maritime pine's seeds.⁵⁵

Francisco Silva and Caetano Batalha's report on the national pinewood of Leiria, resulting from their commission to draw up a topographic map of the pinewood, was published in 1843. In the brief introduction to the report, they equate shipbuilding for overseas expansion with the destruction of the Portuguese woodlands from the reign of Manuel I (1495–1521).⁵⁶ Although this report did not include bibliographical references, during the 1830s and 1840s some highly influential authors negatively reassessed Portuguese overseas maritime expansion. The independence of Brazil forced political thinkers to form a new conceptualisation of the Portuguese nation. Along these lines, in 1832, Mouzinho da Silveira maintained that overseas expansion had increased Portugal's wealth. However, in the long term, this led to economic poverty and corruption because the Portuguese relied more on overseas riches than on the hard work, which, he claimed, was at the root of all virtues and wealth.⁵⁷ During the early 1840s, the influential writer Alexandre Herculano stated that overseas maritime expansion played a major role in the decline of the Portuguese nation. Similarly, António Coelho da Rocha stated that from the reign of D. João II (1481–95) onwards, the Portuguese Crown began its role as a centralising force that eventually triggered the economic and moral decline of Portugal.⁵⁸ In view of these arguments, it is understandable why Silva and Batalha should have claimed that the abundance of Brazilian wood led to the abandonment of the management of the Portuguese woodlands.⁵⁹

The idea of the destruction and lack of management of forests was also shared by foreign authors and foresters, who were especially concerned with the Spanish case. Joachim Radkau traced the black legend about Spaniards' hatred of trees to Carl von Berg, director of the Tharandt Forestry school, and the well-known George P. Marsh. The former stated that Spaniards had a natural aversion to trees because they were more interested in pasturing (the shepherds' guild known as *mesta*), and

⁵⁵ F.L. Guilherme de Varnhagen, *Manual de instruções praticas sobre a sementeira, cultura e corte dos pinheiros* (Lisbon, 1836), pp. 1–12, 24–25.

⁵⁶ F. Silva and C. Batalha, *Memoria sobre o Pinhal Nacional de Leiria* (Lisbon, 1859), pp. 5–9.

⁵⁷ R. Ramos, 'As origens ideológicas da condenação das descobertas e conquistas em Herculano e Oliveira Martins', *Análise social*, 140 (1997), pp. 133–6.

⁵⁸ *Ibid.*, pp. 133–6.

⁵⁹ Silva and Batalha, *Memoria sobre o Pinhal*, p. 7.

attributed the cause of forest depletion to goats. George Perkins Marsh also referred to Spaniards' hatred of forests, adding that Spain had been the only European country not to have implemented forest protection or reforestation measures.⁶⁰

However, if we examine George P. Marsh's essay, it becomes clear that he reproduced John F. W. Herschel's arguments on the interrelations between forests and precipitation.⁶¹ Herschel noted (*Physical Geography*, 1861) Spaniards' hatred of trees in connection with the theory that the aridity of inland Spain resulted from a scarcity of rain that, in turn, was due to the absence of vegetation, especially trees. Without providing any evidence, he claimed that 'the hatred of a Spaniard towards a tree is proverbial'.⁶² This statement became popular and was reproduced on several occasions. To mention but a few, in 1880, Leonard B. Hodges wrote a manual for tree planters that was paid for by the Minnesota State Forestry Association. He literally reproduced George P. Marsh's statements without quoting the source.⁶³

However, George Perkins Marsh went even further. Concerning the lack of forest policies for the protection and the restoration of the woods, Marsh claimed that Spain was 'the only country whose people systematically war upon the garden of God'.⁶⁴ He reinforced his argument after reading Antonio Ponz's essay, who had attributed the desertification of the region of Estremadura to the depredations caused by the *Mesta*. As Grove and Rackham pointed out, it is worth noting that Antonio Ponz hated the forests.⁶⁵

The 1860s and 1870s saw the publication of three essays that scholars have widely used for the history of the Portuguese woodlands. L. Rebello da Silva's report of 1868 was more concerned with Portugal's agricultural production and productivity than with its wooded area. This author was thoroughly steeped in the principles of the nineteenth-century liberal nation-state, according to which private individuals through private property were held to be truly responsible for the economic development (progress) of the nation.⁶⁶ Therefore, it was considered necessary to confiscate all the commons of the municipalities, as well the properties of the religious institutions for the sake of national progress, a measure that had been carried out between 1866 and 1867.⁶⁷

⁶⁰ J. Radkau, *Nature and Power: A Global History of the Environment* (Cambridge, 2008), pp. 189–90.

⁶¹ For the impact of this theory on the creation of the myth of ruined landscape, see Grove and Rackham, *The Nature of Mediterranean*, pp. 8–10. G.P. Marsh, *Man and Nature*, or *Physical Geography* (London, 1864), p. 186.

⁶² John F.W. Herschel, *Physical Geography from the Encyclopedia Britannica* (Edinburgh, 1861), p. 244.

⁶³ L.B. Hodges, *The Forest Tree Planters' Manual* (St. Paul, 1880), p. 148.

⁶⁴ Marsh, *Man and Nature*, p. 279.

⁶⁵ Grove and Rackham, *The Nature of Mediterranean Europe*, p. 15 ft. 28.

⁶⁶ For the construction of the idea of private owners as drivers of the progress of the nation, which justified the seizing of the commons and ecclesiastical properties, see R. Congost, *Tierras, leyes, Historia. Estudios sobre «la gran obra de la propiedad»* (Barcelona, 2007), pp. 219–23.

⁶⁷ L. Rebello da Silva, *Memoria sobre a população e agricultura de Portugal. Desde a fundação da Monarchia até 1865, parte I (De 1097–1640)* (Lisbon, 1868), pp. XI–XVI.

A report on the general reforestation of Portugal came out in 1868, co-authored by Carlos Delgado and Nery Delgado and submitted to the *Ministro das Obras Púbricas, Comércio e Industria* (Ministry of Public Works, Trade and Industry). The report resulted from the decree issued by the Portuguese government on 21 September 1867 concerning the appropriateness of gaining knowledge on the useable or fertile lands for planting tree saplings. One of the main goals of such plantings was to reverse the expansion of sands, for which purpose unsuccessful plantings had been conducted in the 1790s and during the governance of Varnhagen. Ribeiro and Delgado considered the national pinewood of Leiria to be the most important woodlands of Portugal, whose management dated back solely to the 1790s⁶⁸ – in other words, to when the scientific principles of the Enlightenment and physiocracy had been adopted and the early modern forestry administration of the pinewoods of Leiria had been disbanded.⁶⁹ Despite such claims, it is important to note that the author's underlying intention was to collect first-hand information on whether it was advisable to *desamortizar* (to seize or to confiscate) the woodlands of the state, Church, and commons to transfer them to private individuals, for which it was first necessary to gather knowledge on their extent, as well as to quantify and to measure them. This might explain why the author stressed the deplorable situation of the woodlands of Portugal, even though he acknowledged he had very little data to make this assumption.⁷⁰

These authors reported a decrease in the forested area for the purpose of disregarding early modern empirical forestry, as a rhetorical strategy to legitimise: (1) the implementation of the new scientific forestry, especially from the 1860s and 1870s onwards when Bernardino Barro Gomes introduced the principles, ideas, and methods of the new scientific forestry to Portugal, and (2) the *desamortização* (confiscation) of the common lands and those of the religious institutions that were regarded as a relic of former times.⁷¹ Both institutions were said to be incapable of governing natural resources properly, and this was hindering the nation's economic progress. Instead, private owners should be the backbone of national progress. Consequently, only Silva and Batalha identified shipbuilding as the main driver of the destruction of early modern Portuguese woodlands. Incidentally, the forester Varnhagen regarded the pinewoods managed by the Portuguese royal navy as paradigmatic examples of good conservation practices.⁷²

⁶⁸ Delgado and Nery, *Relatorio acerca da arborisação*, pp. 5–7.

⁶⁹ For the ideas of physiocracy applied to the woodlands and the royal forests, see Joanaz de Melo, 'Menos coutadas melhores pinhais', pp. 470–85. For the disbandement of the early modern administration of the pinewood of Leiria, see the royal decree of 17 March 1790; A. Silva, *Collecção da legislação Portuguesa* (Lisbon, 1828), pp. 592–600.

⁷⁰ Delgado and Nery, *Relatorio acerca da arborisação*, p. 14.

⁷¹ Ignacio García Pereda, 'Creando el bosque matemático en la década de 1860. Barro Gomes en la Mata Nacional da Machada (Barreiro, Portugal): testigos cartográficos', in Pedro Fidalgo (ed.), *Estudos da Paisagem* (Lisbon, 2017), pp. 223–40.

⁷² Varnhagen, *Manual de instruções*, p. 9.

When estimating the wooded area of Portugal, Varnhagen also drew a very interesting distinction that was adopted by subsequent authors: between *matas* and *arvores*.⁷³ Cristina Joanaz de Melo correctly stated that there are differences between the current vocabulary and that used in early modern times. Nowadays, the average citizen employs the term *Floresta* or forest to refer to stands of monocultures arranged and managed for the production of wood and cellulose.⁷⁴ She argues that in early modern Portugal, *mata* (woodland) did not refer to a stand of monoculture, but rather to a mixed area of various tree species and bushes or shrubs (*arbustos*), in which there was a predominant tree species after which the woodland was named.⁷⁵ For instance, in the royal forests of Benavente, Muge, Salvaterra, Lamarosa, and Almeirim, the term *pinhal* (pinewood) referred to an area where *Pinheiro-bravo* (maritime pine) was predominant, though other species such as *choupas* (poplars), *freixos* (ash trees), *salgueiros* (willows), *ulmeiros* (elms), *sobreiros* (cork oaks), *carvalhos* (oaks), and *azinheiras* (holm oaks) also grew there.⁷⁶ During the eighteenth century, the vocabulary became more specialised as two distinct terms *mata* and *bosque* were employed. The term *mata* (as a pinewood or *pinhal*) stands for a wooded area cleared of shrubs to permit the growth of trees to produce wood (a woodland).⁷⁷ It is important to shed new light on this matter to better understand the high rates of deforestation reported by nineteenth- and early twentieth-centuries authors.

IV. DEFORESTATION RATES IN THE EARLY MODERN AGE AND NINETEENTH CENTURY: DIVERSE UNDERSTANDINGS OF TREES AND WOODLANDS

In this article, a forest is understood as a legal entity that contained diverse landscapes and multiple land tenures.⁷⁸ In contrast, woodland refers to an ecological entity of a wooded landscape, or *mata* in Portuguese. This section aims to demonstrate that the high rates of deforestation attributed to early modern Iberian Peninsula are partially grounded in a wrong assumption of the ecological reality of what trees and the woodlands were in the early modern Iberian Peninsula.

The wooded landscape of the Basque Country, Spain, for example, benefits from an oceanic climate with an average rainfall of around

⁷³ *Ibid.*, p. 4.

⁷⁴ Melo, 'Menos coutadas melhores pinhais', p. 465.

⁷⁵ C. Joanaz de Melo, 'Floresta em movimento: usar, regenerar, cuidar (séculos XIV–XIX)', in Cristina Joanaz de Melo (coord.), *Como Fênix Renascida – Matas, bosques e arvoredos (séculos XVI–XX)*. *Representações, gestão, fruição* (Lisbon, 2020), pp. 79–130, at p. 92.

⁷⁶ Joanaz de Melo, 'Menos coutadas melhores pinhais', pp. 465–66.

⁷⁷ Joanaz de Melo, 'Menos coutadas melhores pinhais', p. 466; Joanaz de Melo, 'Floresta em movimento', p. 92.

⁷⁸ O. Rackham, *Woodlands*, (United Kingdom, 2006), pp. 141–3; Warde, 'Fear of wood', p. 34. In early modern Portugal, forest was referred as *coutada*.

1100–1200 millimetres, mild and rainy winters, and mild summers without seasonal droughts. Central Spain, however, is characterised by a Continental-Mediterranean climate with very warm and dry summers, and with an annual average precipitation of 450 millimetres. This is an area characterised by dry rivers and green landscape only near the water streams (rivers). The trees are short and have low density. Much of the Iberian Peninsula has a similar climate, which results in the existence of large expanses of non-green landscapes, especially from June to September.

Therefore, my mental construction of a forest landscape was that of monocultures of dense, large, and tall trees. Similarly, dendrochronologist Valerie Trouet stated ‘one hundred years later, these relatively young, monotonous stands constitute my concept of a forest as I was growing up.’⁷⁹ My partner – who comes from Central Europe, and is ingrained with this notion of forest – rejected my idea that the olive groves of the Parque Juan Carlos (Madrid, Spain) can be regarded as a forest because (1) the trees are quite short; (2) they are used for agricultural purposes, or are fruit trees; and (3) the trees are of low density. The three of us shared the same idea of what a forest is, and it does not match either the multifunctional wood-pasture landscapes of early modern Portugal, the savannah-like *montados* and *dehesas*, or the groves of fruit trees.

Nineteenth- and twentieth-century Portuguese silviculturists, such as Bernardino Barros Gomes and Mário de Azevedo Gomes, played a major role in describing the reality of tree canopies in the Iberian Peninsula, and this stemmed from a misconception of what trees and woodlands were. This article argues that the application of the Northern European idea of monoculture woodlands to the diverse and rich diversity of the Portuguese Mediterranean ecosystems had a huge influence in two interrelated areas: (1) on the concept of what a woodland was, with the subsequent effect on assessing the wooded area of Portugal, and (2) on the creation of the national woodlands. The current *matas nacionais* (national woodlands) are mainly composed of monoculture pines or mixed woodlands with a high preponderance of pines.

Concerning the former, Oliver Rackham noted that the wood-pasture was a neglected biome. During the Enlightenment and afterwards, foresters considered that trees growing in grassland landscapes did not deserve to be classified as trees.⁸⁰ More recently, Helen Read and Vikki Bengtsson stated that the wood-pasture system was a common landscape in medieval Southeast England, and it was not until the 1990s that the conservation policies set in motion by the United Kingdom targeted them within the category of ‘wood pasture and parkland’. Curiously, this landscape was not only widespread in Southern England, but it was

⁷⁹ V. Trouet, *Tree Story: The History of the World Written in Rings* (Baltimore, 2020), p. 203.

⁸⁰ Rackham, *Woodlands*, pp. 134–6. Grove and Rackham, *The Nature of Mediterranean*, pp. 191, 213–4.

very likely one of the oldest forms of land use in which multiple socio-economic uses (trees, animals, agriculture) converged.⁸¹

There is a consensus among scholars of Portuguese forestry that Bernardino Barro Gomes was the founder (introducer) of Portuguese scientific forestry in the 1860s after a spell in the forest school of Tharandt, Germany.⁸² Bernardino Barros held that olive groves were not *matas* (woodlands) because they had an agricultural usage. That is why he differentiated between *arboricultura* (arboriculture) for fruit trees, and *silvicultura* (silviculture or modern scientific forestry). However, Bernardino Barros realised that agriculture, cattle, and forestry resources were interconnected activities pertaining to the same landscape.⁸³ Similarly, in the twentieth century, the Portuguese forester Mário de Azevedo Gomes emphasised the difference between *arboricultura* (arboriculture) and *silvicultura* (silviculture). Arboriculture is the knowledge that revolves around fruit trees, and silviculture was the science applied to the management of woodlands, which were composed of trees devoted mainly to producing timber components.⁸⁴

Such an understanding influenced Portuguese forestry policies during the nineteenth and twentieth centuries. In 1852, some Portuguese ministers drew Queen Maria II's (1833–53) attention to the importance of establishing a study programme of agriculture based on scientific principles, in which there were two subjects or branches devoted to the study of wooded areas: (1) horticulture for fruit trees and (2) silviculture for woodlands.⁸⁵ This is not surprising if attention is paid to the woodlands (*matas*) that then made up the administration of the national woodlands. In July 1847, the government issued the regulations for the General (National) Administration of the woodlands of the kingdom of Portugal (*Regulamento para a Administração Geral das Mattas do Reino*).⁸⁶ By that time, the forestry administration was arranged into nineteen administrations, of which thirteen were exclusively composed of pinewoods (68.42%). In turn, the forest regulations of 1872 divided Portugal into three regions: North, Centre, and South, this being the first time in which the concept of *ordenação* (planning) of the territory was mentioned without making a single reference to previous forest legislation.⁸⁷ Did they really believe they were making such a huge innovation that warranted disregarding former forestry policies? The regulations of 1872 listed a total of thirty woodlands, of which

⁸¹ H. Read and V. Bengtsson, 'The management of trees in the wood pasture systems of South East England', in Fernando Allende-Álvarez, Gillian Gómez-Mediavilla and Nieves López-Estébanez (eds), *Silvicultures – Management and Conservation* (London, 2019), pp. 1–25, at pp. 1–3.

⁸² García Pereda, 'Creando el bosque matemático', pp. 223–40; Pinto, *O Pinhal do Rei*, vol. II, pp. 39–56, 443–60.

⁸³ Radich and Alves, *Dois séculos da Floresta*, pp. 52–3.

⁸⁴ *Ibid.*, pp. 82–83.

⁸⁵ Pinto, *O Pinhal do Rei*, vol. II, pp. 443–5.

⁸⁶ In this article, we used the version printed in 1862, *Regulamento para a Administração Geral das Mattas do Reino, aprovado por Decreto de 7 de julho de 1847* (Lisbon, 1862).

⁸⁷ Pinto, *O Pinhal do Rei*, vol. 2, pp. 349–50.

twenty-four were *pinhais* (pinewoods) accounting for 80% of the overall woodlands.⁸⁸

Gerardo A. Pery published the *Geographia e estatística geral de Portugal e colónias* (Geography and general statistics of Portugal and the colonies) in 1875. He sought to quantify the extension of land uses in Portugal (i.e. agriculture, uncultivated lands, grasslands) for which he adapted the calculation performed by Maurice Block in his *Statistique de la France*. This calculation was appropriately corrected and adjusted to the particularities of Portugal and Spain. It is not surprising that Portugal and Spain are by far the two countries with the least woodlands, the case of Portugal being especially shocking. According to Pery, Portugal has 22.57% of agricultural lands and gardens or orchards; a meagre 0.44% of land was used as meadow or grassland; vineyards accounted for 2.27%; only 2.90% of the territory was covered with woodlands; and 71.83% of the land fell under the label of *outras culturas* (other crops; very likely wastelands). In contrast, in Spain, woodland accounted for solely 5.52% of the territory. The Portuguese woodlands were made up of holm oaks, cork oaks, stone pines, maritime pines, and chestnuts (*Castanea sativa*). In addition, fruit trees accounted for 650,000 hectares in Portugal, a category that included: 200,000 hectares of olive trees, 8000 hectares of orange orchards, 30,000 hectares of other orchards, 20,000 hectares of fig groves, 12,000 hectares of carob groves, 10,000 hectares of chestnut trees, and 370,000 hectares of *montados*.⁸⁹

Radich analysed Pery's data in depth and discovered various flaws in the calculations. She even made her own calculations, according to which the woodlands (*matas*) amounted to 260,000 hectares: of these, 210,000 were pinewoods, and 50,000 *soutos* and *carvalhais* (chestnuts and oak groves), to which it is possible to add 650,000 hectares of fruit trees. The 260,000 hectares of pinewoods, chestnuts, and oak groves account for 2.9% of mainland Portugal, which is the figure provided by Pery.⁹⁰ Thus, it is likely that Gerardo A. Pery only considers these three species to be 'woodland'. Even if we accept the premise that fruit trees do not fall under the category of *outras culturas* (other crops), 2.90% of forest cover is an incredibly low proportion.

Such data is even more shocking when compared with the data gleaned from the *Carta Agrícola e Florestal de Portugal* of 1910 (see Table 1). Figure 1 was made from the cadastral maps providing chorographic-agriculture information developed from 1882 to 1905 commissioned by the Portuguese Government. In other words, they were completed between seven (1882) and thirty (1905) years after the publication of Pery's essay (1875).

⁸⁸ *Collecção oficial da legislação Portuguesa: ano de 1872* (Lisbon, 1873), pp. 163–4.

⁸⁹ Gerardo A. Pery, *Geographia e estatística geral de Portugal e colónias* (Lisbon, 1875), pp. 110–12, 122–5.

⁹⁰ Radich and Alves, *Dois séculos de floresta*, pp. 43–45.

Table 1 Distribution of wooden areas in Mainland Portugal in 1875 and 1910

	Surface distribution in hectares according to Gerardo Pery (1875) based on Radich (2000, p. 44)	Proportion of Mainland Portugal (1875) (%)	Proportion of Mainland Portugal (1910) (%)	Surface distribution in hectares according to the <i>Carta Agrícola e florestal</i> (1910)	Proportion of Mainland Portugal (1910) (%)	Proportion of mainland Portugal (1875)
Woodlands (<i>matas</i>) which includes pinewoods, chestnut groves, oaks groves	260,000	2.9	2.92	561,180 ^a	6.29	6.26
Fruit trees that include olive trees, almond trees, orchards, fig trees, carob trees, <i>montados</i>	650,000	7.25	7.29	1,243,016	13.95	13.86
<i>Montados</i> of holm oaks (<i>Quercus ilex</i>) and cork oaks (<i>Quercus suber</i>)	370,000	4.13	4.15	782,653	8.78	8.73
Wooden area according to 1875 and 1910	910,000	10.15	10.21	2,416,863 ^b	27.12	26.97

Source: Own elaboration from the data of Pery (1875, 110–12, 122–4), Radich and Alves (2000, 44–45), and *Carta Agrícola e Florestal de Portugal* of 1910 (Biblioteca Nacional de Portugal, Biblioteca Nacional Digital: 1283706).

^aIt is not included the category of *diversos* (others) listed in the *Carta* of 1910 that raised to 612,667 hectares.

^bIn this case, there are included the 612,667 hectares of *diversos* (others) of the *matas* (woodlands).



Figure 1 *Carta agrícola e florestal de Portugal* (1910); Map of the agriculture and forested areas of Portugal in 1910
 [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

The *Carta* of 1910 provides details not only on the land uses and the distribution of woodlands in Portugal by regions, but also on the terminology employed by the Portuguese technical experts. All the landscapes referred to as trees are included in the category of wooded areas (*superfícies arborizadas*), which is divided in turn into five categories: (1) olive groves; (2) *montados*, a savannah-type landscape comprising cork oaks and holm oaks as the main tree species; (3) fruit trees (i.e. almond, fig, and carob groves); (4) *soutos* (groves) of chestnuts; and (5) woodlands (*matas*) that include oaklands, pinewoods, and others not specified.

The *montados* of cork oaks and holm oaks accounted for 8.78% of mainland Portugal, and the woodlands (*matas*) for 12.23% of the territory. There is a significant issue concerning the woodlands: the oak groves amounted to just 47,006 hectares and the pinewoods to 430,194 hectares, but the *diversos* (others) accounted for a total of 612,667, which might have included orchards. To this data we can add the chestnut groves that covered 83,980 hectares of mainland Portugal. As Table 1 shows, according to the *Carta* of 1910 the pinewoods, oaklands, and chestnut groves represented 6.29% of mainland Portugal, a figure that rises to 13.17% of the country if the *diversos* (others) of the woodlands are included. If we apply the woodland terminology provided by Pery (1875) to the *Carta* of 1910, the extension of woodland increased from 2.9% in 1875 to 6.26% in 1910. The *montados* went from 4.1% to 8.7%, and all the wooded areas from 10.1% (1875) to 27.1% (1910), or from 910,000 hectares to 2,416,863. It is very doubtful that the wooded area increased by 1.5 million hectares in just thirty-five years. Radich and Baptista stated that from 1875 to 1938, the wooded area of the country grew by around 1.8 million hectares.⁹¹ It is very unlikely that such a huge increase occurred between 1882 and 1905, which are the cut-off dates for the materials used to make the *Carta* of 1910.

In 1911, Bernhard E. Fernow published a comprehensive overview of the forestry history of Europe and the United States. He divided Portugal into three main regions: North, Central, and South. Only 10% of the country was forested, and he drew a clear distinction between the woodlands, wood-pastures, and fruit trees:

About 10% of the land area, or 4 million acres, are under forest [woodland], although 2 million more are wooded with olive, fig, almond plantations, or open woodlands and brushwood [...] The composition [of tree-species] is nearly one-half of pine (*Pinus maritima* and *pinia*), one-fifth, cork oak “with pastures,” a little over one-fifth, other evergreen oaks ‘with pastures,’ and the balance, chestnut and deciduous oaks.⁹²

He also deliberately omitted woodlands used for pastoral purposes:

The fact of the extensive private ownership and the reference to the pastures in the enumeration of forest areas suffice to give an idea of the condition

⁹¹ Radich and Oliveira, ‘Floresta e sociedade’, p. 145.

⁹² Fernow, *History of Forestry*, p. 361.

of the most of them. The oak forest is also to a large extent still used for hog raising.⁹³

In other words, by the mid-nineteenth (if not earlier) century, foresters and policy-makers clearly distinguished between the trees for agricultural purpose/fruit trees and woodlands devoted to the production of timber or wood products, disregarding the agroforestry systems characteristic of the Iberian Peninsula. This explains why Pery included only pines, oaks (*Quercus* in general, but not the cork oak and holm oak), and chestnuts in the category of *matas* (woodlands): they were trees capable of producing timber and wood of high quality for construction materials and other purposes. Such an understanding became even clearer among foresters and forest engineers, as was the case of Bernardino Barros, who is considered the founder of Portuguese modern scientific forestry (silviculture). According to James W. Scott, the purpose of state-backed scientific forestry was to create standardised forests alike in age as a ‘one-commodity machine’.⁹⁴ This forestry was based on scientific principles and intended to always deliver the same amount of forest production in cubic meters. Geometrical forests became legible to the eyes of the administration, as they were ‘stands of same-age trees arranged in linear alleys’ in which the processes of planting and extraction (production) were much simpler.⁹⁵ According to Paul Warde, this forestry had its roots in ‘cameral science’, which dated back to the mid-seventeenth century in Germany and developed the theory of ‘sustained yield’ in the eighteenth century. This theory was the cornerstone of modern forestry and was applied to ‘a limited number of reliable conifer species’ by professional foresters with training in surveying and geometry.⁹⁶

This concept of forest clashed with the long-standing tradition of multiple uses and the resulting multifunctional forest landscapes (agroforestry systems⁹⁷) of Iberian societies from at least the thirteenth century, although it is very likely that this can be traced back even further in time. The forest legislation issued by the municipalities of the Iberian Peninsula from the thirteenth century clearly showed that wooded areas were spaces in which agro-sylvo-pastoral uses converged.⁹⁸

⁹³ Ibid., p. 362.

⁹⁴ J.C. Scott, *Seeing Like a State: How Certain Schemes to Improve Human Condition Have Failed* (New Haven, 1998), pp. 14–20.

⁹⁵ Ibid., p. 18.

⁹⁶ P. Warde, ‘The invention of sustainability’, *Modern Intellectual History*, 8/1 (2011), pp. 153–70, at pp. 162–3.

⁹⁷ A. Rigueiro-Rodríguez, J. McAdam and M.R. Mosquera-Losada (eds), *Agroforestry in Europe: Current Status and Future Prospects* (Dordrecht, 2009), for Spain and Portugal see the different contributions (chs. 6–11 and 13).

⁹⁸ Aragón Ruano, *El bosque guipuzcoano, passim*; Á. Aragón Ruano, ‘Una longeva técnica forestal: los trasmochos o desmochos guiados en Guipúzcoa durante la Edad Moderna’, *Espacio, Tiempo y Forma*, 22 (2009), pp. 73–105, at p. 82; Corina Luchía, ‘Por que los montes de esta villa se conserven, e no se disipen como al presente están: la regulación de los recursos forestales en la Corona de Castilla (siglos XIV–XVI)’, *Espacio, Tiempo y Forma. Serie III Historia Medieval*, 33 (2020), pp. 303–32; Corina Luchía, ‘Explotación, conservación y sostenibilidad forestal en las ordenanzas locales de la Corona

Therefore, groves of fruit trees (olive, almond, or fig groves to mention but a few) and the savannah-like landscapes of cork and holm oaks as the *montados*, which were predominant in the Portuguese Mediterranean climate, were not regarded as ‘woodland’. This explains the low figures for woodland cover in the regions located on the left bank of the Tagus river in the *Carta* of 1910 that can be seen in Tables 2 and 3. Table 2 gathers the data on the total extension of the wooded areas in the five regions of the left bank of the Tagus River, and the different land uses (all in hectares). Table 3, in contrast, represents the percentage of the different types of trees cover according to the extension of the region detailed in the *Carta* of 1910.

Woodlands were significant (accounting for at least 9.00% of the territory) in all the regions of Portugal except for Beja (0.05%), Évora (3.8%), Portalegre (2.2%), and Faro (3.7%). These four belonged to a typical Mediterranean ecosystem and possessed considerable stands of *montados* of holm oaks and cork oaks with the exception of the administrative region of Faro where 27.3% of the land was used for fruit trees: *figueiral*, *alfarrobal*, e *amendoues* (fig, carob, and almond groves). Therefore, it is very likely these authors adopted an idea of woodland that did not fit in with the reality of the Mediterranean landscape, in which the *montados* or *dehesas* were (and are still) of great importance.

The administrative region of Lisbon, which includes the basins of the Tagus and Sado rivers, was the exception to our interpretation. Woodlands accounted for 21.78% of the region, but they were only of pinewoods, while the *montados* of cork oaks and holm oaks amounted to 15.66% and 2.57% of the territory, respectively. Added together, these three figures meant that 40% of the administrative region of Lisbon was a wooded area, a percentage that rises to 44.17% if the olive groves are included. Such a high percentage of pinewoods and cork oaks clashed with the idea that shipbuilding had caused permanent damage to the forest cover that had supplied timber to Lisbon shipyards, even though the construction of ships from wood came to an end or was reduced by the 1850s and 1860s.⁹⁹

Moreover, it is very likely that there were also political (ideological) reasons that explain why Enlightenment authors as well as those of the nineteenth and early twentieth centuries disregarded the wood-pasture biome, as it resulted from the early modern political economy based on

de Castilla (siglos XV–XVI), *Universum. Revista de Humanidades y Ciencias Sociales*, 37/2 (2022), pp. 417–37; L.V. Clemente Quijada, ‘Por qué sobrevivió la dehesa?: comunidades locales y Estado moderno en el desarrollo de políticas de conservación y aprovechamiento de las masas forestales durante los siglos XV y XVI’, in Francisco Fernández Izquierdo and Francisco Javier Moreno Díaz del Campo (coords), *Montes, pastos y caza a la vera del Guadiana en las Tablas de Daimiel: la Real Dehesa de Zacatena en la Edad Moderna* (Granada, 2022), pp. 85–105; K. Trapaga Monchet, ‘Conservar para usar, usos para la conservación. Una aproximación a los aprovechamientos forestales en la península ibérica (siglos XV–XVIII)’, in Francisco Fernández Izquierdo and Francisco Javier Moreno Díaz del Campo (coords), *Montes, pastos y caza a la vera del Guadiana en las Tablas de Daimiel: la Real Dehesa de Zacatena en la Edad Moderna* (Granada, 2022), pp. 153–82.

⁹⁹ Pinto, *O Pinhal del Rei*, vol. I, p. 308 and vol. 2, p. 279.

Table 2 The land-use of different tree-covers in 1910 (in hectares)

	Total area of the region	Olive groves (<i>olivais</i>)	Woodland (<i>mata</i>)	Montados of cork oak (<i>sobreiral</i>)	Montados of holm oak (<i>azinhal</i>)	<i>Soutos de castanheiros</i> (chestnuts)	Fruit trees
Beja	1,025,490	26,121	498	67,325	178,144	8	63
Évora	741,950	13,630	28,366	56,434	80,878	—	1472
Faro	501,890	15,651	16,607	15,702	8590	2286	106,110
Portoalegre	623,160	14,009	11,213	71,102	84,932	3906	15
Lisboa	426,184	17,757	92,824	66,731	10,969	—	—

Source: Carta Agrícola e Florestal (1910).

Table 3 Land-use of tree-cover in 1910 (in %)

	Mata (woodland)	Olival (olive groves)	Sobreiral (cork oaks stands)	Azinhal (holm oaks groves)	Soutos de castanheiros (chestnuts)	Fruit trees
Beja	0.05	2.55	6.57	17.37	–	0.006
Évora	3.8	1.83	7.61	10.9	–	0.2
Faro	3.7	3.11	3.13	1.71	0.45	21.14
Portoalegre	2.2	2.25	11.41	13.62	0.63	–
Lisboa	21.78	4.16	15.66	2.57	–	–

Source: Elaboration of the author from *Carta Agrícola e Florestal* (1910).

multiple concentric powers. This notion contrasted with the conception of political economy upheld by nineteenth-century liberal nation-states, which endorsed the state-backed scientific forestry of monocultures stands for producing timber. This idea was at odds with the political economy of the early modern Iberian Peninsula of multiple powers (i.e. local communities, the state) that was reflected in the multiple uses given to the multifunctional landscapes. Moreover, the idea of standardised, same-age forests as ‘one-commodity machines’ advocated by nineteenth-century scientific forestry¹⁰⁰ clashed with the reality of the Mediterranean ecosystems of the Iberian Peninsula.¹⁰¹ Thus, when nineteenth-century Portuguese and foreign authors sought to quantify the forest canopy of Portugal they did not only face huge statistical shortcomings, they also viewed the landscapes through a lens that left out a large portion of the Portuguese forest landscapes because they were composed of wood-pastures (*montados*), or were simply groves of fruit trees. This led them to report a reduction in Portugal’s forest cover, which contributed to disregarding or misjudging the achievements of early modern Portuguese forestry. Administrative neglect of early modern forestry and the empirical know-how possessed by early modern foresters and local inhabitants together with the nineteenth-century centralised state’s lack of a permanent scientific forestry administration were major factors for identifying what they considered to be a huge reduction in Portugal’s forest cover throughout early modern period.

Instead, nineteenth- and twentieth-century Portuguese and foreign authors and foresters drew a distinction between *mata* and *arvoredo*. I argue that this terminological distinction was key to the increase in reported rates of deforestation in early modern Portugal. During the first decades of the eighteenth century, Rafael Bluteau (1638–1734) published

¹⁰⁰ Scott, *Seeing Like a State*, pp. 14–20.

¹⁰¹ Besides the references of footnote 74, see also A. Costa and H. Pereira, ‘Montados e sobreirais: uma espécie, duas perspectivas’, in Joaquim Silva (ed.), *Muito para além dos árvores* (Lisbon, 2007), pp. 17–37; T. Pinto-Correia, N. Ribeiro and P. Sá Sousa, ‘Introducing the montado, the cork and holm oak agroforestry system of Southern Portugal’, *Agroforestry Systems*, 82 (2011), pp. 99–104, at 99–101.

the first dictionary of the Portuguese language, in which the term *arvoredo* refers to *bosque de arvores*, literally ‘woodlands of trees’.¹⁰² He defines the word *mata* as ‘bosque de arvores sylvestres, onde crião feras, ou caça grossa’, a woodland of wild trees where large game and wild animals breed.¹⁰³ In 1789, Antonio de Moraes Silva brought out his dictionary, which refined and enhanced that of Rafael Bluteau. In the entry for the word ‘mata’ or ‘woodland’, he reproduced the meaning given by Rafael Bluteau decades before: ‘bosque de arvores silvestres, onde-se crião feras, ou caça grossa’.¹⁰⁴ ‘Bosque’ or ‘forest’ was a place of trees and woodlands used for hunting: ‘Sitio povoado de arvores, e mata, que serve para caça’.¹⁰⁵ He defined ‘arvoredo’ as a woodland of trees: ‘alameda, bosque de arvores’.¹⁰⁶ He referred to the term ‘coutada’ as the legal concept of forest, a restricted area in which game animals breed.¹⁰⁷ In 1832, Luís Maria da Silva Pinto (from Brazil) restricted the definition of ‘mata’ or woodland to a ‘bosque de arvores sylvestres’, or woodland composed of wild trees.¹⁰⁸ ‘Arvoredo’ was a group of many trees (‘conjunto de muitas arvores’).¹⁰⁹ Therefore, while prior to the nineteenth century there was a difference between *mata* and *arvoredo* but both fell under our category of forest or woodland, nineteenth-century Portuguese scientific forestry mainly considered woodlands to be monocultures of trees devoted mostly to the production and commercialisation of high-value wood and timber.

V. STATE FORESTRY FOR THE PROTECTION OF THE WOODLANDS: NEW INSIGHTS FROM ECOLOGY

This section provides new insights into the forestry policies issued by the early modern Portuguese monarchy for shipbuilding by approaching the historical data and methods for cork oak from the field of ecology. The forestry policies drawn up by the Portuguese crown (as was the case for other European territories such as the Spanish monarchy or the republic of Venice) can be divided into two main categories. The first was concerned with protecting existing woodlands and the second with measures to boost human-induced plantings.

The cork oak is a tree that is perfectly suited to the Mediterranean climate of the region of Alentejo, especially on the left bank of the Tagus river. Scholars have wondered why the Portuguese monarchy did not pass legislation for the planting of cork oaks.¹¹⁰ Similar views were expressed by

¹⁰² R. Bluteau, *Diccionario da Lingua Portuguesa* (Lisbon, 1793), vol. I, p. 126.

¹⁰³ *Ibid.*, vol. II, p. 63.

¹⁰⁴ A. de Moraes Silva, *Diccionario da lingua portugueza composto pelo adre D. Rafael Bluteau, reformado, e accrescentado por Antonio de Moraes Silva* (Lisbon: 1789), vol. II, p. 275.

¹⁰⁵ *Ibid.*, vol. I, p. 294.

¹⁰⁶ *Ibid.*, vol. I, p. 201.

¹⁰⁷ *Ibid.*, vol. I, p. 488.

¹⁰⁸ L.M. da Silva Pinto, *Diccionario da Lingua Brasileira* (Ouro Preto: 1832), p. 106.

¹⁰⁹ *Ibid.*, p. 696.

¹¹⁰ Devy-Vareta, ‘Para uma geografia’, 1986, pp. 30–32.

the Spanish ministers who stayed in the kingdom of Portugal during the Union of Crowns (1580–1640). In 1627, Tomás de Ibio Calderón stated there was little timber left in Portugal because the Portuguese cut down the trees, but did they not plant replacements.¹¹¹ It is necessary to pay attention to the professional career of Tomás de Ibio to shed new light on his assessments. Tomás Ibio had held positions related to shipbuilding in Northern Spain, so it is very likely that he possessed first-hand knowledge of the crown's forestry policies in this area. Broadly speaking, from the mid-sixteenth century onwards, forestry policies (at the local, regional, and state levels) forced the local inhabitants to plant at least one tree for every one they chopped down.¹¹² Oak was the species mainly targeted, and throughout the seventeenth and eighteenth centuries, hundreds of thousands of plantings were performed in Guipuzcoa, Biscay, and other regions. This strategy positively contributed to the social, economic, and environmental sustainability of the forests of, at least, Guipuzcoa and Biscay throughout the Early Modern Age.¹¹³

Unfamiliarity with Mediterranean tree species was also displayed by well-educated experts, such as the German botanist Henry Frederick Link when travelling around Portugal and Spain from 1797 to 1799. In 1798, he noticed that the Portuguese did not pay attention to the cultivation of either holm oaks or cork oaks, which he regarded as a negligence.¹¹⁴ Cork oaks behave differently. This species is predominant on the left bank of the Tagus river (the Alentejo region), along which the crown logged the timber for shipbuilding. Currently, the landscape of the Alentejo region is mainly composed of *montados*, that is, a characteristic Mediterranean ecosystem. This is a savannah-like landscape made up of cork oaks and holm oaks with different tree canopy densities and characterised by supplying human societies with multiple socio-economic resources (e.g. agriculture, grazing, pasturing, woods, charcoal). According to Jacques Blondel and James Aronson, the biota and ecosystems of the Mediterranean regions have been constantly manipulated and 'redesigned' for the past few thousands of years, and rural dwellers have proved capable of establishing a sustainable system. The key point for sustainable land use and resource management of the Mediterranean region is to find the 'intermediate disturbance' of the human impact on the environment, of which the agro-silvo-pastoral systems of the *montados* is a paramount example.¹¹⁵ In this matter, the ecology of these agroforestry systems provides us with

¹¹¹ D. Goodman, *Spanish Naval Power, 1589–1665. Reconstruction and defeat* (Cambridge, 1997), p. 83.

¹¹² Aragón Ruano, *El bosque guipuzcoano*, pp. 43–8, 98–100; A.J. Martínez González, *Las Superintendencias de Montes y Plantíos (1574–1748): derecho y política forestal para las armadas en la Edad Moderna* (Valencia, 2015), pp. 55, 59–61, 77–83.

¹¹³ Aragón Ruano, *El bosque guipuzcoano*, pp. 98–100; Álvaro Aragón Ruano, 'Siete siglos de sostenibilidad en Guipúzcoa (siglos XIII–XIX)', *Manuscrits: Revista d'història moderna*, 42 (2020), pp. 65–88.

¹¹⁴ H.F. Link, *Travels in Portugal, and through France and Spain* (London, 1848, p. 148, 418). See also, Grove and Rackham, *The Nature of Mediterranean*, p. 203.

¹¹⁵ Blondel and Aronson, *Biology and Wildlife*, pp. 199–201, 216–17.

new insights into better understanding not only the scope of medieval and early modern forestry policies but also the empirical knowledge and know-how that the local inhabitants had when it came to managing cork oaks.

The equilibrium of this unique ecosystem (*montados*) is achieved through a very careful management that is grounded in establishing a balance between the different socioeconomic activities.¹¹⁶ While Pinto-Correia and Sá Sousa identified charcoal production as one of the main threats for the conservation of the *montado* system, Grove and Rackham stated that cork oaks were lopped to obtain charcoal, as well to increase the yield of acorns for animals and humans.¹¹⁷ These management practices were previously defined as harmful to cork oaks and are now considered effective for their conservation.¹¹⁸ Although we do not have any data on the management techniques used in early modern Portugal, Henri F. Link stated in his trip across Portugal in 1798–99 that the cork oaks were not managed enough:

This bark it throws off, if it be not peeled, which ought to be done, as its growth is thereby improved; and I remember to have seen many crippled trees, which seemed to have been stifled as it were in the bark. The red stem of the peeled tree thus exposed has a singular appearance. It should seem that sufficient care is not bestowed of this tree in Portugal; perhaps it is not often enough peeled.¹¹⁹

Moreover, human-induced plantings of cork oaks are highly challenging, and the natural regeneration of the cork oaks is also demanding.¹²⁰ As stated, it is highly challenging to unravel the historical management of trees from the archival sources. While it is very likely that the local authorities had already enacted legislation – based on long-standing management practices – for the protection of some tree species, the oldest references concerning the management of cork oaks issued by the Crown dated back to the early fourteenth century. In 1302, the king D. Dinis I granted the farmers of the *montados*¹²¹ of Campo de Ourique and Santiago de Caçem permission to cut branches to perform agricultural work using farming oxen but without cutting any other part to avoid damaging the tree. This might be evidence of the convergence

¹¹⁶ J. Muñoz-Rojas et al., ‘The Portuguese *Montado*: A complex system under tension between different land use management paradigms’, in Fernando Allende-Álvarez, Gillian Gómez-Mediavilla and Nieves López-Estebánez (eds), *Silvicultures – Management and Conservation* (London, 2019), pp. 83–99, at pp. 83–87; Pinto-Correia and Sá Sousa, ‘Introducing the montado’, pp. 99–102.

¹¹⁷ Pinto-Correia and Sá Sousa, ‘Introducing the montado’, pp. 99–101.

¹¹⁸ Lopping differs from coppicing, pollarding, and shredding, in the fact that the four main branches (boughs) of the cork oaks are managed to grow wider than taller: “From the four boughs spring tufts of branches and foliage (chupones), which are cut at intervals supposedly of nine years. This cutting, which we shall term *lopping* [...] yields wood, and is held to increase the yield of acorns and to reduce the shade on what grows beneath”, Grove and Rackham, *The Nature of Mediterranean*, pp. 48, 198.

¹¹⁹ Link, *Travels in Portugal*, p. 418.

¹²⁰ *Ibid.*, pp. 99–101.

¹²¹ It is not possible to ascertain if *montado* refers to the current *montado* agroforestry system.

of agriculture, animals, and trees in the same land-unit management (an agroforestry system). Although the 1302 legislation did not mention tree species, it very likely referred to cork oak or holm oak, as only eight years later (1310) another royal order was issued. This one deliberately set out to protect cork oaks from being cut from the trunk or large branches. More interestingly, this regulation stated that harvesting the trees should be done in accordance with the practices of Évora and other cities of the Alentejo, areas characterised by the *montado* system.¹²²

In 1320, the Crown turned again to the groves of cork oak and holm oak in Campo de Ourique and Santiago de Caçem. These municipalities complained of the destruction caused by the king's officers and the *rendeiros*, so the king gave orders for them to be protected, mainly for cattle. This regulation also made it forbidden to bark and to *cernar* these trees. *Cerne* refers to the core of the trunk, the heartwood. In other words, activities liable to kill trees were prohibited. The regulation furthermore demonstrates that cork oaks and holm oaks were included in landscapes in which cattle and agricultural activities were conducted.¹²³

In the early modern period, scholars have extensively addressed the so-called law on trees (*Lei das Árvores*) passed in 1565. In legal terms, the law was a breakthrough as it encouraged an active policy of plantings that encompassed all mainland Portugal.¹²⁴ The law gave priority to the planting of pines, oaks, and chestnuts, and other non-specified tree species that were suited to the soil qualities. Nicole Devy-Vareta is the only author who has posed the key question: why did the crown disregard cork oak when it was the most important tree species for shipbuilding and highly valuable to the local inhabitants? The author provides a set of socio-economic reasons to explain this omission: underlying vested interests in charcoal production and other lucrative activities together with the land tenure.¹²⁵

By this time, the Portuguese crown had issued a law that specifically addressed the conservation of the existing cork oaks. In 1546, nobody was permitted to cut cork oaks from the base (as this cutting prevents regrowth) to produce cork, charcoal, or ashes in a regional area that extended from Lisbon to Abrantes and ten leagues (sixty kilometres) on either side of the Tagus river.¹²⁶ The specification of those three socio-economic activities points to the high level of (empirical) knowledge that the crown had on the ecology of cork oaks, as these three activities are currently also regarded as the most acknowledged threats to the *montado* system.¹²⁷ Moreover, there is not a single policy to encourage the plantation of cork oaks, possibly because the early modern Portuguese

¹²² Neves, *História florestal*, vol. 1, pp. 54–55.

¹²³ Neves, *História florestal*, vol. 1, pp. 62–64.

¹²⁴ BNL, res-90-37-a.

¹²⁵ Devy-Vareta, 'Para uma geografia', 1986, pp. 30–31.

¹²⁶ Nunes de Leão, *Leis Extravagantes*, P. IV. Título 17, Lei XI.

¹²⁷ Pinto-Correia and Sá Sousa, 'Introducing the montado', p. 101.

possessed empirical knowledge of the challenges that arise from both human-induced and natural planting of cork oaks, as current knowledge asserts.¹²⁸ The best way to ensure the regeneration of cork oaks is to achieve an equilibrium between agro-silvo-pastoral socioeconomic activities. This might explain the fact that the laws of 1546 and 1564 did not detail prohibitions on introducing cattle, grazing, or agriculture.¹²⁹

VI. CONCLUSION

Scholars from the 1950s to the present day have blamed shipbuilding for being the main driver of deforestation in early modern Portugal. In particular, the ocean-going ships of the period of maritime expansion were held to be the main agents of forest destruction. Save for a few exceptions, both quantitative and qualitative approaches have repeated this narrative, which has become predominant in the related literature. A detailed study of the sources used by these authors shows that they mainly reproduced the claims of early modern Portuguese forestry legislation with no regard for the writings of nineteenth-century authors.

However, an analysis of the largest documentary corpus on Portuguese forestry policies from the late thirteenth to the late sixteenth century points to a different conclusion.¹³⁰ While there were some references to damage caused to trees, claims of destruction or shortages of wood resources only began in the 1530s. Notably the first references dated back to 1536–1538 when the crown granted a private individual and some monasteries powers to establish a legal forest in woodlands which people were thoroughly barred from entering. These claims spread to forestry policies for imperial shipbuilding in the 1550s and 1560s, at a time that witnessed the issuing of the law on the protection of cork oaks for the Sado river (from Setúbal to Alcácer do Sal) and the so-called *lei das árvores* (law on trees), the first of its kind to promote plantings on a Portugal-wide level. The idea of the destruction of the woodlands and major shortages of wood and timber became predominant in the narrative of forestry policies until the end of the seventeenth century at least.

In addition, Portuguese and foreign authors and foresters cited a large array of causes to explain the low levels of forest cover in Portugal prior to the 1870s. Batalha and Silva were the only authors who directly held shipbuilding responsible for the destruction of the Portuguese woodlands.¹³¹ Varnhagen, instead, stressed that the woodlands managed for shipbuilding were the best-preserved woodlands of Portugal. Charcoal making was labelled as the largest enemy of the woodlands.¹³² Conversely, most nineteenth- and early-twentieth-century authors (both from Portugal and abroad) largely attribute deforestation

¹²⁸ *Ibid.*, p. 101.

¹²⁹ Nunes de Leão, *Leis Extravagantes*, P. IV. Título 17, Lei XI.

¹³⁰ Neves, *História florestal*, 6 vols.

¹³¹ See footnote 66.

¹³² Varnhagen, *Manual de instruções*, pp. 8–10.

either to the gross negligence of the early modern administration or to the lack of sound policies well into the eighteenth century.¹³³

These authors further drew attention to the inefficiency of early modern forestry administration when they provided calculations of the deforestation rates.¹³⁴ While it is very likely these authors underestimate the effectiveness of early modern administration in legitimating the new nineteenth-century scientific forestry policies, this article argues that a significant part of deforestation rates is due to a shift in the concept of what a woodland was. According to James C. Scott, the purpose of state-backed scientific forestry was to create standardised, same-age forests as a 'one-commodity machine'.¹³⁵ This forestry was based on scientific principles and intended to always deliver the same amount of forest production in cubic meters. Therefore, the multifunctional landscapes of the Early Modern Age and the Mediterranean climate, particularly the *montados* of cork oaks and holm oaks, clashed with the scientific forestry of the nineteenth century. This divergence is especially clear when comparing the data of Pery (1875) with that of the *Carta Agrícola e Florestal* (1910). While Gerardo Pery stated that only 2.9% of Portugal was forested,¹³⁶ the *Carta Agrícola e Florestal* of Portugal of 1910 points to a very different reality of the land uses and landscape of Portugal.¹³⁷ However, there is still much research to conduct on the conceptual history of forested landscapes from the medieval (if not earlier) to the current times.

Furthermore, at this point, doubts arise as to when the idea of imperial shipbuilding as a driver of deforestation became hegemonic. It is clear that since the 1940s and 1950s, scholars have blamed shipbuilding for being a cause of ecological degradation, but this argument was not hegemonic, or even principal, among the nineteenth-century authors consulted here. Therefore, future research needs to revisit the second half of the nineteenth and early twentieth-century Portuguese authors who addressed the history of the Portuguese Empire (i.e. Alexandre Herculano, Oliveira Martins, Sousa Viterbo).

Moreover, an analysis of the historical data on the protection and plantings of cork oaks from the perspective of the ecology of the *montados* suggests that early modern empirical forestry had a great deal of knowledge on the management of cork oaks. The difficulty of regenerating cork oaks through human-induced plantings might explain why early modern forestry policies focused on protecting existing cork oaks rather than on promoting plantings.

¹³³ To mention but few see Silva, *Memoria sobre a necessidade*, pp. 17–20; Silva and Batalha, *Memoria sobre o Pinhal*, pp. 6–9; Fernow, *History of Forestry*, pp. 360–2. Another example for the Spanish case in George P. Marsh, *Man and Nature*, pp. 186–7, 279.

¹³⁴ All of them have been studied in Radich and Alves, *Dos séculos de Floresta*, pp. 40–9.

¹³⁵ Scott, *Seeing Like a State*, pp. 14–20.

¹³⁶ Pery, *Geographia e estatística*, pp. 110–12, 122–5.

¹³⁷ See the section 3.2 of this article.

CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest.

PEER REVIEW

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