

Forest Protection Tax Policy in the Context of Portuguese Societies

A Política Fiscal à Proteção Florestal no Contexto das Sociedades Portuguesas

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ABSTRACT

This article aims to study the fiscal incentives for forest protection in Portugal. Understanding the reality of this fiscal policy is fundamental in the context of sustainable forest management. After reviewing the literature focused on the importance of the forest as an essential asset to meet human needs, the Portuguese tax regime in this area is analysed. This is followed by a study of tax incentives for Forest Intervention Areas (FIA) and Forest Management Plans (FMP) in the Portuguese business context in the period 2015-2020. The main results of the research show that companies connected to the sector have become more aware of the importance of adopting more sustainable practices, by adhering to these tax benefits over time, showing the role of environmental tax policy in the sustainable growth of the economic tissue. The results show that the number of beneficiary companies is reduced compared to the total number of companies operating in the forestry sector in Portugal, also verifying that most of these companies are concentrated in a small number of municipalities, some of which have no FIA. There is still important work to be done with a view to greater dissemination of the tax benefits under study.

KEYWORDS: Tax Policy, Green Taxation, Forest Intervention, Corporate Social Responsibility, Portugal

JEL Codes: Q580, K20, K34

RESUMO

O presente artigo tem como objetivo o estudo dos incentivos fiscais à proteção florestal em Portugal. Compreender a realidade desta política fiscal é fundamental no âmbito da gestão florestal sustentável. Para o efeito, depois da revisão da literatura focada na importância da floresta enquanto

bem essencial para a satisfação das necessidades humanas, analisa-se o regime fiscal português nesta matéria. Seguidamente, procede-se ao estudo, no contexto empresarial português, no período de 2015-2020, dos incentivos fiscais às Zonas de Intervenção Florestal (ZIF) e aos Planos de Gestão Florestal (PGF). Os principais resultados da investigação mostram que as empresas ligadas ao setor se tornaram mais conscientes da importância da adoção de práticas mais sustentáveis, através da adesão a estes benefícios fiscais ao longo do tempo, mostrando o papel da política fiscal ambiental no crescimento sustentável do tecido económico. Ainda assim, os resultados evidenciam que o número de empresas beneficiárias é reduzido face ao total de empresas a atuar no setor das florestas em Portugal, verificando-se também que a maior parte dessas empresas se concentra num número reduzido de municípios, alguns dos quais sem ZIF. Há, portanto, ainda um importante trabalho a realizar com vista a uma maior divulgação dos benefícios fiscais em estudo.

PALAVRAS-CHAVE: Política Fiscal, Fiscalidade Verde, Intervenção Florestal, Responsabilidade Social das Empresas, Portugal

Códigos JEL: Q580, K20, K34

1. INTRODUCTION

It is important to keep in mind that environmental goods should be essential for the fulfilment of human needs (Hauschild, *et al.*, 2020). Forest life on Earth is the foundation of life on planet Earth. It cannot be ignored that everyone is all part of the planet's ecosystem and that there is a serious current problem caused by deforestation, loss of natural habitats and soil degradation. It is therefore essential to promote the sustainable use of ecosystems and the preservation of biodiversity (Linser & Wolfslehner, 2022). And that can be done through government tax policy.

The forestry sector is an important and decisive strategy for the development of countries, specifically for their regional and local economies (OECD, 2012). However, it is known that forest protection requires a collective action led by governments, promoting shared forest intervention through regulatory public policies, including tax policies, such as tax incentives for Forest Intervention Areas (FIA) and Forest Management Plans (FMP).

The change of paradigm may operate at the level of environmental tax policy, considering, on the one hand, penalisation through aggravated taxation for those who pollute and degrade the most, and on the other hand, inducing more sustainable production and consumption patterns, reinforcing the social responsibility of citizens and companies, that can happen through the granting of tax benefits (Lobo, 2022; David & Gallego, 2009).

Indeed, the tax burden should not be the only concern of tax systems (Dias & Dinis, 2021), so it is understood that tax incentives are justified by the required guidance of governments to reduce the pressure on taxpayers and at the same time promote economic development, internationalization of countries, and sustainability (Picas *et al.*, 2021).

In general, tax incentives are an advantage as they allow not only a financial gain but also a social utility (Dinis & Martins, 2022), affecting the value of corporate social responsibility (Na *et al.*, 2021). Therefore, as far as forestry is concerned, policymakers should design tax policies that aim at creating incentives for private forest owners to adapt to climate change, focused on encouraging them to remain interested and involved in protecting their forest (Thomas *et al.*, 2022; Kilgore *et al.*, 2018).

In this sense, the concern around all those involved and particularly the companies (which are the object of study in this research) is not only related to the level of taxation but to the increasing awareness of the demand for social balance and environmental preservation, to promote sustained economic growth based on corporate social responsibility. There is no doubt that sustainability promotes the economic growth of companies (Zhang & Song, 2022).

This paper explores the productivity of Portuguese companies that have accessed the tax incentives for forest protection in Portugal (regarding Corporate Income Tax, Municipal Real Estate Tax and Municipal Real Estate Transfer Tax), studying their economic features. It was adopted as a research strategy in the case study of the Portuguese beneficiary companies, in the period from 2015

to 2020, focusing on answering the following research questions: What are the economic features of the Portuguese companies that take advantage of the tax incentives to establish forests? Are companies that promote this type of action more profitable?

This research aims to contribute to the debate on the importance of this tax policy and the impact of sustainable protection and intervention in the forestry sector.

This paper is structured into four sections. Firstly, some preliminary reflections are made on the forest as an essential asset for satisfying human needs, presenting a brief analysis of the forest area in the international context. Secondly, tax incentives for Forest Intervention Areas (FIA) and Forest Management Plans (FMP) are analysed as tax policies for forest establishment in Portugal. Thirdly, the authors analyse and discuss the economic and financial data of the companies that have taken advantage of the tax benefits under study. Fourthly, the conclusions of the study are presented.

2. LITERATURE REVIEW

2.1. The forest dimension of the territories: some brief reflections and international perspective

For decades, experts and forestry scientists have been concerned about the future of the world's forests, but it has also become an increasing matter of public concern (Linser & Wolfslehner, 2022). Moreover, the adoption by countries of international commitments to reduce deforestation and repair forests shows a transformation in the countries' thinking related to the use of forest resources. Examples of these agreements are the Paris Agreement on Climate Change, the Global Strategic Plan for Biodiversity 2011-2020, and the Sustainable Development Goals Agenda.

The Organisation for Economic Co-operation and Development (OECD) considers that, given the size of the world's forests, it should be considered as a factor for the green growth and development of countries (OECD, 2012).

In 2020, the world has a total forest area of 4.06 billion hectares (ha), which is 31% of the total land area (Food and Agriculture Organization, 2020). Table 1 shows the evolution of global forest area by continent over the period 1990-2020.

Table 1. Evolution of forest area by continent (%\percentage points)-1990/2020

Continent	Forest Area (%\percentage points)				
	1990	2000	2010	2020	Variation (1990-2020)
Africa	17.5	17.0	16.5	15.7	-1.8
Asia	13.5	14.1	14.9	15.3	1.8
America	40.8	40.3	39.6	39.3	-1.5
Europe	23.8	24.1	24.7	25.0	1.2
Oceania	4.3	4.4	4.4	4.6	0.3

Source: Data extracted on 13 OCT 2022, from *Food and Agriculture Organization (FAO)*. Stat, <https://fra-data.fao.org/>

Analysing Table 1, since 1990, America has been the continent with the highest percentage of forest area in the world, followed by Europe and Africa. Although, from 1990 to 2020, America suffered a decrease in the forest area of 1.5 percentage points. The same situation occurred in Africa, where over the years forest area has been decreasing, with a decrease of 1.8 percentage points from 1990 to 2020. Europe together with Asia and Oceania registered a positive variation in the percentage of forest area, 1.2, 1.3 and 0.3 percentage points, respectively.

Facing forest area as an indicator of countries' development, it is particularly relevant to analyse the evolution of this indicator in Table 2.

Table 2. Evolution of the forest area in selected countries (%\percentage points)

Countries	Forest Area (%)				Variation (percentage points)		
	1990	2000	2010	2020	1990/2000	2000/2010	2010/2020
Angola	63.6	62.3	57.9	53.4	-1.2	-4.5	-4.5
Australia	17.4	17.2	16.9	17.4	-0.3	-0.3	0.6
Brazil	70.5	65.9	61.2	59.4	-4.5	-4.7	-1.8
Canada	38.8	38.8	38.7	38.7	-0.1	-0.1	0.0
China	16.7	18.8	21.3	23.3	2.1	2.5	2.1
Colombia	58.5	56.5	54.8	53.3	-2.0	-1.7	-1.5
Democratic Republic of the Congo	66.4	63.5	60.5	55.6	-3.0	-3.0	-4.9
India	21.5	22.7	23.4	24.3	1.2	0.6	0.9
Indonesia	65.4	53.9	53.1	49.1	-11.5	-0.9	-4.0
Japan	68.4	68.2	68.5	68.4	-0.2	0.2	-0.1
Peru	59.7	58.8	57.9	56.5	-0.9	-1.0	-1.3
Portugal	37.1	35.9	35.5	36.2	-1.3	-0.4	0.6
Russian Federation	..	49.4	49.8	49.8	..	0.4	0.0
United States of America	33.0	33.1	33.7	33.9	0.1	0.6	0.1
OECD Members	32.3	32.4	32.6	32.8	0.1	0.2	0.2

Source: Data extracted on 13 OCT 2022, from Food and Agriculture Organization (FAO). Stat, <https://fra-data.fao.org/>

Table 2 exhibits the evolution of forest land area in the selected countries compared to OECD countries. Six countries show negative deviations in the periods under analysis, namely, Angola, Brazil, Colombia, the Democratic Republic of the Congo, Indonesia, and Peru. In the remaining countries, there is also some decrease in forest areas. China was the country that registered the largest increase in forest area from 1990-2020, at 6.7 percentage points. In the same period, Portugal decreased by 1.7 percentage points from 1990-2010 and increased by 0.6 percentage points of its forest area from 2010-2020, failing to counteract the effect of the decrease in previous years.

When comparing the evolution of forest areas with the average of the OECD members, the authors find that 79% of the countries analysed (11 from selected countries) for the year 2020 present values above the OECD average. In the same year, Japan is the country with the largest percentage of forest area in the total area of the country, followed by Brazil, Peru, and the Democratic Republic of the Congo.

Thus, it is verified that there is a general trend of decreasing the forest area of the countries, as has already been evidenced by Zambrano-Monserrate *et al.* (2018), which says that the disappearance of half of the world's forests is due to the expansion of agriculture and livestock, as well as the need to use the raw materials of the forests as fuel. These actions had an important weight in the economic growth of the countries but have serious forest impacts and environmental problems.

As this study focuses on a tax policy associated with private forestry and linked to the business sector, seems relevant to study the proportion of private forestry areas by type of owner, revealing for this study the business entities and institutions. Thus, it was only possible to analyse this indicator for the year 2015, because it was the last year in which the country's forest inventory was conducted. Table 3 shows the forest area by three types of owners, individuals, companies and business entities, and tribal and local communities, by continent for 2015.

Table 3. Area of forest in three types of private ownership, by continent, 2015

Region	Data availability		Forest ownership (% ha)		
	No. of reporting countries	total forest area (%)	Individuals	Business entities and Institutions	Local, tribal, and Indigenous communities
Africa	32	71	4	11	85
Asia	31	29	56	14	30
Europe	28	92	78	18	4
North and Central America	12	51	55	25	19
Oceania	9	21	0	0	100
South America	3	8	0	4	96
WORLD	115	50	51	20	29

Source: Food and Agriculture Organization (FAO) (2020).

The information presented here collected forest areas owned by distinct types of private owners in 2015 from 115 countries and territories, representing 50% of the world's forest area. Given the low coverage, the analysis presented here provides only a partial view of this indicator at the global and regional level, allowing us to understand what the proportion of owners would be concerning the world's forest area.

Of the total private forest area in 2015, individuals accounted for 51%, local and tribal communities for 29%, and corporate entities and institutions for 20%. Private ownership was the predominant type of private ownership in Europe (78% of total private forest area) and North and Central America (55%). In Africa, by contrast, local, tribal, and Indigenous communities accounted for 85% of the total privately owned forest area. The available data are not sufficient to obtain results for the other continents, but they allow us to understand that there is a portion of the world's forest area whose owners are business entities and institutions.

As mentioned before, there is a tendency of decreasing the forest area in the world, which is worrying because the forest provides multiple services to societies, from products and raw materials for the business sector to climate change mitigation and ensuring the well-being of the population (Winkel *et al.*, 2022). In this sense, and due to the importance of forests for all countries, it is critical to promote sustainable forest management that considers and promotes the multifunctional role of forests (Vadell *et al.*, 2022).

Private forest owners are the main group of forest owners in Europe, holding forest areas ranging from a few hundred to several thousand hectares (Tiebel *et al.*, 2022).

As this study reflects the effects of tax incentives applied to companies owning private forests, it is important to understand the evolution of private forest areas (including those owned by companies) in the total forest land of the countries. Table 4 shows the ten countries with the largest private forest areas for the three years under analysis (1990, 2010 and 2015) and the variation of the private forest area over the years.

Table 4. Evolution of the private forest area (% forest land), by Countries in 1990-2015

Countries	Forest Area (%)						Variation (percentage points) 1990-2015	
	1990		2010		2015		Public	Private
	Public	Private	Public	Private	Public	Private		
Portugal	1.7	98.3	3.0	97.0	3.0	97.0	1.3	-1.3
Norway	12.3	87.7	12.3	87.7	12.3	87.7	0.0	0.0
Austria	18.0	82.0	25.8	74.2	18.0	82.0	0.0	0.0
Slovenia	37.2	62.8	25.3	74.7	23.0	77.0	-14.2	14.2
France	26.0	74.0	24.7	75.3	24.0	76.0	-2.0	2.0
Sweden	24.4	75.6	24.3	75.7	24.3	75.7	-0.1	0.1
United Kingdom	34.6	65.4	28.4	71.6	27.6	72.4	-7.0	7.0
Iceland	65.2	34.8	53.2	46.8	29.5	70.5	-35.7	35.7
Finland	30.7	69.3	30.4	69.8	30.4	69.8	-0.3	0.5
Estonia	43.4	56.6	41.3	58.7	48.2	51.8	4.8	-4.8

Source: Data extracted on 17 OCT 2022 13:42 from Eurostat, <https://ec.europa.eu/eurostat/> and Unece Statistical Database, <https://unece.org/data>

As can be seen from the data in Table 4, in the years under analysis, the Country with the highest percentage of private forest area is Portugal, specifically in the year 2015, with 97%, followed by Norway, Austria, Slovenia and France, with 88%, 82%, 77% and 76% respectively. If compared to 1990, only two countries have reduced their private forest area, Portugal, and Estonia, by 1.3 percentage points and 4.8 percentage points, respectively. In general, the remaining countries have been increasing their private forest area, with special attention to Iceland, which has increased its private forest area by about thirty-six percentage points.

Private forest management has raised the concern of policymakers about the increasing diversity of private forest owners in Europe (Ficko *et al.*, 2019). Nichiforel *et al.* (2018) agree that there is a growing need to think about new public policies that recognize the importance of private forests and improve the provision of forests' significantly valuable ecosystem services, considering the challenges of environmental change, with private forests becoming more widespread in Europe.

Towards the need to understand the relationship and involvement of private forest owners with forest management, table 5 indicates some studies concerning private forest owners and forest management.

Table 5. Studies focusing on private forest owners¹

Studies	Country	Main Conclusions
(Thomas <i>et al.</i> , 2022)	France	Policymakers should design public policies that aim to create incentives for private owners to adapt to climate change. Thus, it will allow them to remain interested and involved in protecting their forest.
(Sonnhoff & Selter, 2021)	Germany	Supporting private forest owners and promoting social interactions provide opportunities to solve problems that they cannot solve by themselves.
(Juutinen <i>et al.</i> , 2020)	Finland	Forest owners' beliefs regarding the effects of forest management are relevant because people tend to persist in their past habits, while new habits are difficult to establish. This also applies to sustainable practices in private forest management.
(Feliciano <i>et al.</i> , 2017)	United Kingdom	Private forest owners play a key role in maintaining the sustainability of forest ecosystems, recognizing that forest management translates into preserving forests for future generations.

The main guidelines for strategy and management actions in the forest sector are public policies for forest protection, governance practices to protect forest areas, legislation, and management for forest growth, monitoring and reporting (Mackey *et al.*, 2020). Thus, there is a need to promote truly sustainable forest management that considers the impacts of climate change and the role of private

¹ The data collection process for the selection of the studies presented included an initial search of the Elsevier and Science Direct databases for the keyword "private forest owners". Articles from the last 5 years and representative of different countries were selected.

forest owners. Table 6 reflects recent studies about sustainable forest management, relating its importance and objectives to the role of forest management owners.

Table 6. Studies focusing on sustainable forest management²

Studies	Country	Main Conclusions
(Condé <i>et al.</i> , 2022)	Brazil	Sustainable forest management represents an effort to achieve ecological sustainability and socio-economic development through the rational exploitation of the resources provided by forests.
(Degnet <i>et al.</i> , 2022)	Netherlands	For private forest owners to understand and promote sustainable forest management, they need to be aware of the factors that influence it and be provided with the relevant information to change their thinking.
(Thomas <i>et al.</i> , 2022)	France	Because climate change has a serious impact on sustainable forest management, good adaptation strategies must be implemented. Therefore, for policymakers to design public policies to encourage forest owners to adapt to climate change, a better understanding of how private forest owners' choices are made is needed to understand the best adaptation strategies.
(Kraxner <i>et al.</i> , 2017)	Austria	Sustainable forest management has multiple objectives and is of vital importance for several Sustainable Development Goals, promoting the sustainable use of terrestrial ecological systems and balancing greenhouse gases among many other benefits.

Kimengsi & Deodatus Ngu (2022) justify that there is a need for community participation that translates the connection between forests and the involvement of people in ensuring sustainable forest management. Thus, these authors emphasize that only community participation can meet the objectives of sustainable forest management. Parajuli *et al.* (2022) point out that community involvement in forestry requires policymakers to consider the interests of local forest managers to increase social acceptability. In addition to the interests of forest managers, Kidu *et al.* (2017) argue that community forest management provides several benefits for private forest owners, such as increased productivity, improved water quality, and most importantly, reduced wildfires and their impacts.

As shown in Table 2, there is a tendency of decreasing the forest area of the countries over the years. Mieziute *et al.* (2022) consider that global climate change may be the basis for decreasing forest areas and the increase of fire activity, bringing high risks to society. Similarly, Asfaw *et al.* (2022) agree that the number of fires and burned areas has increased in recent decades, resulting in significant social and economic impacts. Table 7 shows some studies that consider fires to be the main risk factor that should be considered in the construction of forestry public policies.

Table 7. Studies on wildfires and forest public policies³

Studies	Country	Main Conclusions
(Lasanta <i>et al.</i> , 2022)	Spain	Wildfires are one of the main factors in the transformation of several countries. However, it is only recently that fire prevention and forest intervention policies have begun to reverse the tendency of fire impacts.
(Asfaw <i>et al.</i> , 2022)	Canada	Due to the intensity of climate change in the world, an expansion of fires and their impacts is expected in Mediterranean Europe.
(Figueiredo <i>et al.</i> , 2021)	Portugal	We are facing a changing world where the frequency of natural disasters is increasing and most of the long-term consequences are still not well understood.
(Dupuy <i>et al.</i> , 2020)	France	Due to the context of global warming and watching forest fires threatening forest values and ecosystem services as well as people, the change in fire regimes should be considered by policymakers to improve the adaptation of forest and fire management.

As mentioned above, the forest sector and the practice of sustainable forest management must be considered as one of the countries' priorities, especially when it comes to environmental tax policies.

² The data collection process for the selection of the studies presented included an initial search of the Elsevier and Science Direct databases for the keyword "sustainable forest management". Articles from the last 5 years and representative of different countries were selected.

³ The data collection process for the selection of the studies presented included an initial search of the Elsevier and Science Direct databases for the keywords "wildfires" and "forest public policies". Articles from the last 5 years and representative of different countries were selected.

2.2. The strategic political vision for forestry: the role of tax incentives

Taxation presents a crucial tool for government intervention in the development of countries. It is in this sense that tax incentives are an advantage since they can increase corporate competitiveness by allowing the use of benefits and turning them into a source of value for companies (Dinis & Pereira, 2022; Picas *et al.*, 2021; Eckert & Bertolla, 2017). The behaviour of economic agents who often adopt less desirable behaviour, or unintentionally, can be influenced by tax incentives (Kacem & Omri, 2022).

Furthermore, the granting of tax benefits leads to the economic success of companies as it directly affects the direct increase in net profit, by reducing corporate tax costs (Yu *et al.*, 2022; Na *et al.*, 2021). In this context, Lu *et al.* (2022) agree that companies that become more sustainable see their profitability improve.

Table 8 shows some studies that reflect on the importance of green taxation in the business context.

Table 8. Studies on green taxation in the business context⁴

Studies	Country	Main Conclusions
(Delgado <i>et al.</i> , 2022)	Spain	Because of the change in taxation in recent decades, environmental taxes increasingly play a significant role in the way of looking at current and future taxation. Thus, the purpose of creating these taxes is based on changing the behaviour of economic agents, such as companies or households.
(Kouam & Asongu, 2022)	South Africa	A tax system should promote environmental friendliness by encouraging incentives for companies to reduce their consumption and encourage the development of technologies and good practices.
(Rahman, 2022)	Bangladesh	Taxation plays a key role in achieving the Sustainable Development Goals (SDGs) as it is internally connected to development, promoting investment, job creation and sustainable economic growth.
(Fendrich <i>et al.</i> , 2022)	Brazil	Green taxation promotes incentives for economic agents to prefer consumption choices aligned with desired environmental objectives, reducing activities with negative impacts on the environment.

The development of a green economy is at the top of the European Union's agenda, reflecting the urgency felt to respond to the environmental challenges of climate change and the current increasing pressure on natural resources (Degnet *et al.*, 2022).

As said before, tax incentives can promote green efficiency by improving the total factor productivity of firms and provide long-term benefits, being positively associated with corporate environmental economic output (Li *et al.*, 2022; Vieira *et al.*, 2022).

Environmental regulation improves environmental return and inevitably affects economic productiveness (Zhang & Song, 2022; Noja *et al.*, 2020). For this reason, these authors consider that Governments should implement green tax policies by adopting incentives targeted at economic growth and environmental development.

There is a growing understanding of the importance of implementing public policies that promote the conservation and sustainable management of forests. These policies aim to ensure the long-term preservation of a country's forest resources (Tadesse *et al.*, 2022; Thomas *et al.*, 2022; Chaudhary *et al.*, 2017). Such policies recognise that forests provide a wide range of benefits, including ecological, social, and economic services (Linser & Wolfslehner, 2022; Hauschild, *et al.*, 2020).

Götze and Hartmann (2021) show that governments in Europe and around the world place a high priority on limiting land use, considering forest taxation policies as all political and legal measures applied to regulate land use according to a politically defined goal.

Taxation has been a subject of considerable interest, passion, and occasional controversy within the forestry community and between the forestry community and other sectors in the world (Frey, 2023).

⁴ The data collection process for the selection of the studies presented included an initial search of the Elsevier and Science Direct databases for the keywords "green taxation" and "business". Articles from the last 5 years and representative of different countries were selected.

Therefore, there is no doubt that tax credits promote sustainability. Although at distinct levels, as Nadir Junior *et al.* (2021) state, at an important level, promotes economic sustainability; at a moderate level, social sustainability; and at a low level, environmental sustainability.

The authors present their vision on green taxation, considering that the greatest impact of tax incentives is on the economic dimension, followed by the social perspective, through the promotion of certain desirable environmental behaviours and, finally, environmental sustainability. Nevertheless, the authors argue that tax policies are not sufficient and cannot be the only measures to combat climate change and the environmental protection of countries.

In the case of forests, Daigneault *et al.* (2020) highlight the ecosystem service benefits of tax policy incentivizes carbon sequestration levels. Also, Gautan *et al.* (2021) emphasise that the main advantage of tax incentives for forest conservation is to channel investment into activities that would otherwise not be economically viable. However, they can be detrimental because they rely on tax discipline and collection and are of limited relevance to small farmers. Furthermore, for c there is not sufficiently evidence that forest property tax schemes promote forest conservation, and the solution may lie in redesigning public policies with fewer requirements and rules.

Existing literature reviews focus on the effects of forest taxation on forest management and the financial and economic aspects of private forest owners (Gong & Susaeta, 2020; Lu *et al.*, 2020; Li, 2019; Chang, 2018), with limited research on the combined effects of taxation and forest conservation.

Some studies have focused on factors influencing landowner enrolment in preferential forest property tax programmes (Frey *et al.*, 2019; Harasym *et al.*, 2019; Cushing & Newman, 2018; Kilgore *et al.*, 2018).

Participation in voluntary financial incentive programmes (such as tax incentives) among forest owners is low across countries, as highlighted by Aguilar & Kelly (2019). However, Graves *et al.* (2022) suggest that voluntary incentive programmes that compensate owners of non-industrial private forests (NIPFs), either based on the adoption of forest carbon management practices or on the amount of carbon sequestered, can be valuable and effective tools for NIPF management.

On the other hand, comprehensive information on these programmes, including the specific ecosystem services promoted, the extent of forest area enrolled, the number of participants, and the size of annual tax incentives, is often incomplete or not fully understood (Meier *et al.*, 2019; Kilgore *et al.*, 2018).

Furthermore, forest-related property taxation must be used primarily as a mechanism for forest protection and intervention and land planning, rather than as a revenue-generating tool for public administration (Taranu & Verbeeck, 2022; Wenner, 2018).

The focus of this research is as follows the study of tax incentives for forest sustainability in Portugal, particularly, the benefits granted to corporate beneficiaries.

3. THE PORTUGUESE TAX INCENTIVES FOR FOREST SUSTAINABILITY IN THE CONTEXT OF ENVIRONMENTAL TAX POLICIES

In Portugal, the structure of the forest, the lack of sustainable forest management, the limited inventory of private forest properties, the significant drop in forest area, and the frequency and intensity of wildfires have highlighted the need for cooperation and organization of private forest owners in a shared forest planning and management strategy (Lobo, 2019). In general, there is a high degree of probability of wildfires in Portugal, as has been the case over the years (Ribeiro *et al.*, 2020).

After the catastrophic wildfires of 2003, there was a need for legal restructuring of forest protection and management, and consequently, the FIA law was established by Decree-Law no. 127/2005, with the last legislative amendment by the Decree-Law no. 67/2017.

The main objectives of FIA are to promote the sustainable management of forest spaces, coordinate the recovery of these spaces and reduce the conditions for the ignition and propagation of wildfires.

In the meantime, following the recommendations of the OECD and intending to contribute to greater innovation and efficient use of resources, as well as implementing instruments to achieve environmental objectives, in 2015 the Portuguese government introduced the Green Taxation

Reform which came into force by Law no. 82-D/2014, with measures and proposals for new tax policies for environmental intervention in several sectors of activity: energy and emissions, transport, forests and biodiversity, among others. For the first time, this reform brings a cross-cutting vision of intervention across sectors and resources, assessing the economic, social, and environmental impacts of taxpayers' choices (Portuguese Ministry of Environment, Spatial Planning and Energy (MAOTE), 2015). As a result, several tax policies were introduced to motivate forest intervention and planned forest management (Rodríguez *et al.*, 2019).

Specifically, concerning tax incentives for FIA and FMP, tax incentives are foreseen in two types of taxes in Portugal, such as income tax, namely Corporate Income Tax and taxes on property, such as Municipal Real Estate Tax and Municipal Real Estate Transfer Tax. These incentives are established in the Portuguese Tax Incentives Statute (TIS) in article no. 59.º D and 59.º G. Table 9 presents the description of the tax incentives under analysis in this research, by tax typology.

Table 9. Tax incentives by tax typology established for forest establishment

Tax types/ FIA or FMP	Forest Intervention Areas (FIA)	Forest Management Plans (FMP)
Corporate Income Tax	<i>Article no. 59.º D no.12 of TIS</i> Increase of the deduction up to 140% of the costs incurred by forest owners and producers belonging to FIA.	<i>Article no. 59.º G of TIS</i> Exemption of income obtained by forest management entities and forest management units.
Municipal Real Estate Tax	<i>Article no. 59.º D no.7 of TIS</i> Exemption of municipal property tax rural properties in FIA.	<i>Article no. 59.º D no.7 of TIS</i> Exemption of municipal property tax on rural properties in a FMP.
Municipal Real Estate Transfer Tax	<i>Article no. 59.º D no.2 of TIS</i> Exemption of tax on onerous transfers of the right of ownership on the acquisition of buildings corresponding to forest areas.	<i>Article no. 59.º D no.3 of TIS</i> Exemption of tax on onerous transfers of the right of ownership on the acquisition of rural properties intended for forestry exploitation.

To integrate the economic needs of local forest producers into a FMP, it is important to understand the owner's sense of participation in the decision-making process and the benefits that come with it (Tadesse *et al.*, 2022). Degnet *et al.*, (2022) state that environmental benefits have become priority objectives for sustainable forest management, including in forest owners' perception of their responsibility.

The authors analysed the evolution of tax incentives granted in Portugal for sustainable forest management, to corporate beneficiaries. Table 10 shows these values and their variation for the period from 2015 to 2020.

Data show that tax benefits allocated to FIA and FMP in Portugal have increased significantly in the period under analysis (a growth rate of beneficiary companies of 907% in 6 years) on a total of more than 6 million euros (which translated into an overall increase of €1,481,561). This is mostly justified by the “increase of the deduction of up to 140% of the costs incurred by forest owners and producers belonging to FIA” (corporate income tax benefit), amounting in the period to €2,216,546. The second highest amount of tax benefits granted relates to the “exemption of tax on onerous transfers of the right of ownership on the acquisition of buildings corresponding to forest areas” (a property transfer tax benefit), which in the period under review reached the amount of €3,582,726 (an increase of €510,405).

These results highlight that companies have become more aware of this tax benefit understudy over time, reaching its peak in 2019 with a tax incentive granted of almost 2 million euros. The positive evolution in the last years is a positive marker. Even so, the authors note that the number of companies signing up is slight. This may be important to consider in the tax policy definition, so that more companies may be aware of these incentives, which promote more sustainable forest protection practices. The latest available data in the Portuguese PORDATA (Portuguese-certified statistical database) identifies more than 125.000 companies in the agriculture, animal production, hunting, forestry, and fishing sectors. Therefore, compared to this number of companies beneficiaries, 141 companies benefiting from the tax incentive under study seems very tiny.

Table 10. Evolution of tax incentives granted to companies for forest establishment_ (2015-2020)

Tax Benefits (€)/Year	2015	2016	2017	2018	2019	2020	Total 2015-2020	Variation 2015-2020
Increase of the deduction of up to 140% of the costs incurred by forest owners and producers belonging to FIA	8,165	0	0	375,290	1,056,383	776,708	2,216,546	+768,544
Exemption of income obtained by forest management entities and forest management units	0	0	0	0	1,576	122,922	124,498	+122,922
Exemption of municipal property tax rural properties in FIA	17,010	6,796	20,487	29,870	29,746	32,259	136,168	+15,248
Exemption of municipal property tax on rural properties in a FMP	1,569	31	3,262	3,263	3,262	3,262	14,650	+1,692
Exemption of tax on onerous transfers of the right of ownership on the acquisition of buildings corresponding to forest areas	257,527	776,438	725,210	390,030	665,589	767,931	3,582,726	+510,405
Exemption of tax on onerous transfers of the right of ownership on the acquisition of rural properties intended for forestry exploitation	0	0	1,075	36,150	117,737	62,749	217,711	+62,749
Total	284,270	783,265	750,035	834,603	187,4293	1,765,832	6,292,298	+1,481,561
Number of corporate beneficiaries in the database	14	20	30	41	58	57	141	907%

4. RESEARCH METHODOLOGY: CASE STUDY OF PORTUGUESE TAX INCENTIVES FOR COMPANIES, FOR FORESTRY ESTABLISHMENT

4.1. Sample characterization

By resorting to Portuguese Tax Authority information regarding companies that have adhered to tax benefits in Portugal a detailed database was created for the period 2015 to 2020, analysed using SPSS software, to assess tax benefits granted for forest establishment.

The economic and financial data of the companies were collected from the SABI (database of financial analysis of Portuguese and Spanish companies). The details of the database for the period under analysis (2015-2020) are presented in Table 11.

Table 11. Detail of the database of companies' beneficiaries_2015-2020

Companies' beneficiaries	Percentage
Municipality	
Coruche	19.1
Lisboa	16.3
Leiria	4.3
Montemor-o-Novo	4.3
Santa Maria da Feira	3.5
Almeirim	2.8
Others	49.6
District	
Santarém	29.8
Lisboa	21.3
Évora	8.5
Leiria	8.5
Setúbal	6.4
Others	25.5
Region	
Lisboa and Tagus Valley	54.6
Alentejo	19.9
Centre	15.6
North	7.8
Others	2.1
Main economic activity	
Combined farming and livestock production	14.9
Forestry	13.5
Real estate purchase and sale	10.6
Forestry and other forestry activities	9.2
Service activities incidental to forestry and logging	3.5
Others	48.2
Secondary economic activity	
Forestry activities	7.8
Services activities related to hunting and restocking of the game	6.4
Buying and selling of real estate	5.7
No secondary economic activity	12.8

An analysis of Table 11 shows that most companies' beneficiaries are from Lisboa and Tagus Valley region (54.6%) and Alentejo (19.9%). Specifically, the companies' beneficiaries belong to the districts of Santarém (29.8%) and Lisboa (21.3%), and most of them have their headquarters in the municipalities of Coruche (19.1%) and Lisboa (16.3%). This concentration in certain regions and districts can be attributed to several factors such as favourable business environment, infrastructure, access to markets and industry clusters (Frey et al., 2019).

As for the economic activity of the beneficiary companies, 14.9% develop their activity in “Combined farming and livestock production”, and 13.5% in “Forestry”. This finding is consistent with the emphasis on ecosystem services and forest conservation mentioned in the study by Frey et al. (2019). In this study, landowners' desire to keep forested land forested was positively correlated with enrolment in the forest tax policy, indicating a similar interest in forest conservation among beneficiary companies in Portugal.

Of the companies analysed, 87.2% conduct a secondary economic activity, of which 7.8% develop their activity in “Forestry activities”, and 6.4% in “Services activities related to hunting and restocking of the game”. This finding is consistent with the variability in enrolment levels and programme structure observed in the Frey et al. (2019) study, indicating that landowners may have multiple objectives and concerns when participating in forest tax programmes.

4.2. Data analysis and results

4.2.1. Descriptive statistics

Table 12 presents the descriptive statistics focusing on the number of companies that had taken advance from tax benefits for forest establishment, showing the data by municipality and tax benefit bracket. The authors chose for analysis the municipalities that concentrate the highest number of companies benefiting from the tax incentive under study.

Table 12. Tax benefits for FIA and FMP_ data by municipality and tax benefit bracket (2015-2020)

FIA_FMP municipality\ tax benefits bracket 2015-2020	FIA_FMP <= 1000	>1000 FIA_FMP <= 5000	>5000 FIA_FMP <= 10000	> 10000 & FIA_FMP <= 20000	FIA_FMP > 20000	Total (%)
Coruche	5	8	1	3	10	36
Almeirim	0	1	1	1	1	5
Chamusca	0	0	1	0	3	5
Leiria	0	2	1	2	1	8
Lisboa	3	4	3	2	11	31
Montemor-o-novo	0	0	1	1	4	8
Santa Maria da Feira	2	1	0	0	2	7
Total	10	16	8	9	32	-
% of beneficiary companies in the database	7	11	6	6	23	53

The top seven municipalities represent 53% of the total companies' beneficiaries in the period in analysis. Among the seven municipalities analysed, the municipalities of Coruche and Lisboa are the ones that respectively concentrate 36% and 31% of the beneficiary companies analysed. It should also be noted that 23% of the companies took advantage of more than twenty thousand euros of the tax benefits under study, in the period from 2015 to 2020. What is worrying in these results is the fact that tax benefits are concentrated in an exceedingly small number of municipalities where the companies analysed are based (75 companies).

The analysis allowed the authors to gauge the number of companies, benefiting from the incentive under study, located in municipalities with FIA.

Table 13 shows that the largest number of companies, representing almost 20% of the companies in the database, have their headquarters in the municipality of Coruche (Santarém district), whose FIA in 2020 was 156,594 hectares, the one with the largest area, of all those analysed in this study.

Also, the FIA that refers to the municipalities of Arraiolos, Estremoz, Évora and Montemor-o-Novo (district of Évora), with an area of 82,304 hectares, in 2020, concentrates 7% of the analysed companies. Another relevant data, which is important to highlight is the fact that more than 41% of the analysed beneficiary companies have their headquarters in municipalities without FIA. Table 14 exhibits the mean values of the tax benefits by tax typology.

The mean values are higher for tax benefits for FIA and FMP in municipal property transfer tax. The results show that, although the maximum amounts obtained from tax benefits for forest establishment, by the companies under analysis, are concentrated on corporate income tax, the percentage of beneficiaries is higher in real property transfer tax benefits (72.3%), which justifies the average amount of €26,528.67. The study by Frey et al. (2019) found moderate evidence that preferential forest property tax programmes (PFPTPs) reduce forest land use change or sale, albeit with a weak effect. In contrast to this finding, the data presented suggest that the tax typology with the highest tax benefits, specifically the land transfer tax, has the highest power in the analysed dataset. This raises questions about the effectiveness of tax policy in achieving the desired outcomes of forest conservation and discouraging land use change or sale. The fact that a higher percentage of beneficiary companies receive tax benefits under the land transfer tax, together with the higher average tax benefits in this category, contradicts the initial hypothesis that these tax incentives would lead to increased forest conservation efforts. Instead, it suggests that the tax policy, as currently implemented, may not be effective in discouraging land-use change or the sale of forest land.

Table 13. Companies benefiting from forest establishment tax incentive (2015_2020), located in municipalities with forest intervention areas (FIA)

Municipalities	No. of beneficiary companies	%	FIA (hectares)_2020
Coruche	28	19.86	156,594
Arraiolos, Estremoz, Évora e Montemor-o-Novo	10	7.09	82,304
Avis, Mora e Ponte de Sôr	5	3.55	52,005
Almerim e Alpiarça	5	3.55	27,369
Chamusca	4	2.84	82,835
Santiago do Cacém	3	2.13	30,962
Oleiros e Sertã	3	2.13	6,268
Abrantes	2	1.42	50,343
Oliveira do Hospital, tábua, Arganil	2	1.42	20,980
Ourique	2	1.42	11,611
Alcobaça	2	1.42	9,779
Alenquer, Azambuja e Cadaval	2	1.42	8,007
Grândola	2	1.42	6,952
Figueira da Foz e Montemor-o-Velho	2	1.42	2,505
Alcácer do Sal	1	0.71	118,317
Castelo Branco	1	0.71	61,923
Barrancos, Moura e Mourão	1	0.71	37,368
Seia	1	0.71	27,322
Rio Maior	1	0.71	24,993
Alcochete, Benavente, Montijo e Palmela	1	0.71	24,000
Fundão, Idanha-a-Nova, Penamacor	1	0.71	7,623
Mação	1	0.71	7,248
Tondela	1	0.71	6,729
Chaves	1	0.71	4,795
Sardoal	1	0.71	1,218
Total number of companies headquartered in municipalities with FIA	83	58.87	-
Total number of companies headquartered in municipalities without FIA	58	41.13	-

Table 14. Summary statistics of the tax benefits for FIA and forest management plans (FMP_ data by tax typology

Tax benefits by tax typology	maximum (€)	mean (€)	std. Deviation	% of beneficiary companies in the database
total tax benefits: FIA + FMP (corporate income tax)	1,175,665.72	16,603.14	126,444.05	18.4
total tax benefits: FIA + FMP (real estate tax)	94,658.12	1,494.42	9,549.28	13.5
total tax benefits: FIA + FMP (real property transfer tax)	282,677.63	26,528.67	44,583.58	72.3

Even so, of the companies analysed, 18.4% accessed the benefit of corporate income tax, with the average value assigned being 16,603.14 euros. The study by Frey et al. (2019) also found limited evidence that PFPTPs encourage more active forest management. Although the data provided do not directly measure forest management activities, it can be inferred that the tax benefits associated with corporate income tax may be more relevant for active forest management. The tax benefits for corporate income tax are higher compared to the other tax typologies, suggesting that companies

receiving these benefits may have a greater motivation to engage in active forest management practices.

The real estate tax benefits were the ones that were accessed by the fewest companies (13.5%) in the period under analysis, with an average amount much lower than the others, of €1,494.42. The study by Frey (2023) emphasises the importance of designing PFPTPs with clear policy objectives and considering distinctive characteristics to understand their impact. In the context of the data provided, it is noteworthy that the average tax benefits for corporate income tax are low compared to the maximum value, indicating variability in the benefits received by different firms. This suggests that there may be different policy choices or requirements within this tax typology, leading to different outcomes in terms of forest retention and active management.

4.2.2. Bivariate analysis

To study the relationship between the tax incentives for forest establishment granted on average, in the period under review, and the key variables related to companies' beneficiaries' economic features, a bivariate analysis was employed. Table 15 reports the correlation coefficients.

Table 15- Correlation coefficients

Companies' beneficiaries' economic features		txbenef fia_fpm_mean 2015_2020	mean_fia_fmp_cit 2015_2020	mean_fia_fmp_rst 2015_2020	mean_fia_fmp_rptf 2015_2020
net_profit_mean 2015_2020	R	0.346**	0.387**	-0.016	-0.080
	p	<0.001	<0.001	0.850	0.346
eq_mean 2015_2020	R	0.069	0.094	-0.012	-0.063
	p	0.415	0.265	0.888	0.461
turnover_mean 2015_2020	R	0.774**	0.830**	-0.019	-0.080
	p	<0.001	<0.001	0.828	0.346

Notes: ** Pearson correlations are significant at the 0.01 level (2-tailed); **R**= Correlation coefficient; **txbenef_fia_fpm_mean_2015_2020**= average tax benefits granted to forests, relating to forest intervention areas (fia) and forest management plans (fmp), in the period from 2015 to 2010; **mean_fia_fmp_cit_2015_2020**= average tax benefits granted to forests in corporate income tax; **mean_fia_fmp_rst_2015_2020**= average tax benefits granted to forests in real estate tax; **mean_fia_fmp_rptf_2015_2020**= average tax benefits granted to forests in real property transfer tax; **eq_mean_2015_2020**= average equity of companies in the period 2015 to 2020; **net_profit_mean_2015_2020** = companies net profit on average, from 2015 to 2010; **turnover_mean_2015_2020** = companies' average turnover in the period 2015 to 2020

From the results obtained, it is possible to underline that the highest significant and positive correlation (R=77.4%) relates to companies' average turnover in the period 2015 to 2020, particularly in tax benefits granted on average in income tax (R=83%). This shows that as tax incentives increase on average (and more those related to the increase of the deduction up to 140% of the costs), the companies' average turnover also increases, which confirms the importance that the tax benefits under study have for companies, namely by allowing them to increase their sustainability and grow their business, attracting clients who are concerned with the sustainable practices of companies. It cannot be forgotten that businesses and companies are being increasingly scrutinised in terms of sustainability.

4.2.3. Results discussion

The importance of public policies to promote forest conservation and sustainable management is increasingly recognised, recognising the environmental, social, and economic benefits that forests provide. Taxation plays a key role in these policies, with tax credits promoting sustainability at distinct levels (Linser & Wolfslehner, 2022; Tadesse et al., 2022; Thomas et al., 2022; Hauschild, et al., 2020; Chaudhary et al., 2017).

However, tax policy alone is not sufficient to address climate change and environmental protection. Tax incentives for forest conservation can incentivise carbon sequestration and channel

investment into economically viable activities, but they have limitations and may require public policy redesign (Gautan et al., 2021; Daigneault et al., 2020).

While research has focused on the financial and economic aspects of forest taxation and the factors that influence landowner enrolment in tax programmes, participation in voluntary incentive programmes remains generally low (Graves et al., 2022; Gong & Susaeta, 2020; Lu et al., 2020; Aguilar & Kelly, 2019; Frey et al., 2019; Harasym et al., 2019; Li, 2019; Chang, 2018; Cushing & Newman, 2018; Kilgore et al., 2018).

Comprehensive information on these programmes is often incomplete, and forest-related property taxes should primarily serve forest protection and land planning purposes (Meier et al., 2019; Kilgore et al., 2018).

The obtained results align with Picas *et al.*, (2021), which showed that tax incentives have a direct influence on the profitability of companies, revealing that when firms benefit from tax incentives, their profitability increases consequence of the tax burden drop. Eckert & Bertolla (2017), through their study, analyse the effect of economic and financial factors on profitability, using tax incentives as the analysed variable and concluded that there is a positive relationship between firms' use of tax incentives and their profitability.

The study by Frey et al. (2019) suggests that PFPTPs can potentially reduce forest land use change, sale or parcelling, although the effect may be weak. However, an examination of the data provided shows that the tax typology with the highest tax benefits, the real estate transfer tax, contradicts this conclusion. The data show that companies benefiting from the real estate transfer tax receive the highest tax benefits in terms of both maximum and average values. This suggests that these companies may have a stronger financial incentive to change or sell land use than to promote forest conservation.

Furthermore, the higher percentage of beneficiary companies receiving tax benefits under the real estate transfer tax supports the notion that these companies may be more inclined to engage in land-use change or the sale of forest land. These findings suggest that the current tax policy, particularly concerning the real estate transfer tax, may not be effective in promoting forest conservation or discouraging land-use change. It raises questions about the overall effectiveness of PFPTPs in achieving their intended conservation goals.

Table 15 also highlights that the allocation of tax benefits for forest sustainability is relevant to companies' net profit. The average net profit of the companies is statistically correlated (significant positive correlation, $R=34.6\%$) with the tax incentives to which the companies had access during the period under analysis. The results found clearly show that investing in sustainability (in the case under study, in the support of forest) increases the return for companies.

This result is explained by Na *et al.* (2021) who conclude that tax incentives provided to companies increase their net profit and a consequent immediate improvement in their productivity. Moreover, Lu *et al.*, (2022) and Noja *et al.*, (2020) found a positive and significant bidirectional relationship between sustainability and financial execution. The authors conclude that as firms become more sustainable, their financial profitability improves.

Furthermore, because of the link between environmental tax incentives and corporate social responsibility (CSR), companies must promote their sustainable investments because customers are increasingly loyal and recommend companies that are dedicated to CSR (Vieira *et al.*, 2022).

5. CONCLUSIONS AND IMPLICATIONS OF THE STUDY

Experts and forestry scientists have been concerned about the future of the world's forests. The adoption by countries of international commitments to reduce deforestation and repair forests shows a transformation in the countries' thinking related to the use of forest resources. There has been a world trend of decreasing forest area in the world. In this sense, governments must promote sustainable forest management. And more so in the business context, appealing to their social responsibility.

In this respect, taxation is a valuable tool for government intervention with businesses, specifically the environmental tax benefits, which not only allow companies to reduce their tax burden but also increase their corporate social responsibility. Therefore, as far as forestry is

concerned, policymakers should design tax policies focused on encouraging forest owners to get involved in protecting the forest.

This paper aimed to analyse the Portuguese companies that have accessed the tax incentives for forest protection. Data show that tax benefits have increased significantly for the period 2015 to 2020 out of a total of more than six million euros in 6 years. This highlights that companies have become more aware of this tax benefit under study over time.

A bivariate analysis was conducted to study the relationship between the tax incentives for forest establishment granted, and the characteristics of the beneficiary companies. From the results obtained, it is possible to underline that the highest significant and positive correlation relates to companies' average turnover. Also stands out that the companies' net profit on average is statistically correlated with the tax incentives to which the companies had access in the period under review.

The results obtained in this study are in line with others that have concluded that the companies that survive today in the market, increasing their profitability, are those that adopt more sustainable practices.

Despite this, and even though the conclusions obtained follow, in general, the conclusions obtained by other international studies, the authors cannot fail to notice, in the case of Portugal, that the adherence of companies to forest establishment tax incentives is still very low compared to the number of companies in sectors related to the forest. Added to this is the fact that a considerable percentage of beneficiary companies (41%) are headquartered in municipalities without FIA, which leaves us with the question of the practical effectiveness of these benefits concerning the desirable change in the behaviour of economic agents towards more environmentally sustainable options and decisions.

Although the percentage of beneficiary companies using the corporate income tax typology is low (18.4%), the maximum amount of the tax incentive granted under this typology is significantly higher compared to the other tax typologies. The higher maximum amount of tax benefits suggests that corporate income tax incentives may play a role in promoting and supporting active forest management practices among a select group of companies. This suggests that while a smaller proportion of companies benefit from this tax incentive, those that do receive substantial support, indicating a more targeted approach to incentivising active forest management. These findings are consistent with the study by Frey et al. (2019), which highlighted the potential for forest tax policy to encourage more active forest management.

However, the findings of this analysis, combined with the main conclusions of the previous studies analysed, suggest that there may be room for improvement in the current policy of tax incentives for forestry in Portugal. While green tax incentives are recognised as an important public policy tool to promote sustainability, it is worrying that many companies do not take advantage of these incentives, as shown in this study. This suggests a potential gap in knowledge, awareness, or accessibility of these incentives in the business community. Considering this, the authors' preliminary assessment is that the Portuguese government may benefit from a reformulation of the tax incentive policy for forestry. By reviewing and refining these incentives, and removing any barriers to their effective use, the government can encourage greater participation and engagement by companies, thereby promoting a stronger commitment to sustainable practices in the forestry sector. Such a reformulation can help bridge the gap between policy intentions and actual implementation and contribute to advancing the environmental transition agenda in Portugal.

To a real change in paradigm and thinking, companies need to be aware of the factors that promote sustainable forest management by adhering to the associated tax benefits.

In this sense, and despite the conclusions obtained, there must be greater reinforcement in the dissemination of these benefits, particularly in municipalities with a larger FIA so that the number of companies benefiting from forest tax incentives is wider and with greater territorial coverage.

Given the limited research that has been conducted in Portugal on this subject, our study intends to contribute to the dissemination of the role of forest tax benefits and their role in changing corporate behaviour, particularly in a country where the area of forestry has been suffering a reduction in recent years.

Accordingly, the authors suggest the adoption of a methodology for monitoring and evaluating tax incentives, with guidelines for their creation, validation of their impact during their period of effectiveness, and proper evaluation based on the principles of their creation.

Further research is needed to better understand the relationship between tax incentives and forest use decisions. Future studies could explore the specific characteristics of tax policies, examine the behaviour and land management practices of beneficiary companies, and compare results between different tax incentives to gain deeper insights into the effects of specific policy choices.

To gain a more comprehensive understanding of the relationship between tax incentives and forest land use change, further research and analysis would be needed, including an assessment of the specific characteristics of the tax programmes and an evaluation of the actual land management practices and outcomes of the beneficiary companies. This would help to provide a clearer picture of the effectiveness of tax policies in achieving desired conservation objectives.

In this regard, consideration should be given to examining specific policy features, the behaviour of beneficiary companies, and actual land management practices to gain a more comprehensive understanding of the effects of preferential forest property tax regimes on land use change and forest conservation.

In conclusion and given the urgent need to raise awareness of sustainability to accelerate the environmental transition process, the authors emphasise that this study has practical and political implications, as it can help companies to become more involved in the use of tax incentives and can strengthen their role in promoting sustainable behaviour.

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