

9. Forest management and wood exploitation. A comparison between public and private Spanish forests (1900-2000)

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I. Introduction

The objective of this paper is to investigate whether the differing property rights established over Spanish forests (*i.e.* those pertaining to publicly administered forests and those pertaining to private forests) had different environmental effects during the twentieth century. As Araujo *et al.* (2008) pointed out, there are many works that have investigated the relationships between property rights and the environmental effects on forests. The majority of these studies have been carried out in developing countries, and have established a direct relationship between insecurity of property rights and the destruction of forests (*e.g.*, Deacon, 1999; Mendelsohn, 1994). However, scant attention in this respect has been paid to the countries of Western Europe, perhaps because the implication is that the modern property rights established in this part of the world from at least the nineteenth century on avoided such problems. Greater attention nevertheless deserves to be paid to that relationship in especially Mediterranean countries such as Spain, which has experienced serious erosion that can be connected, at least in part, to the disappearance and degradation of many wooded areas over the course of her history. Available data confirm that, between the middle of the nineteenth century and the 1970s, Spain saw her forested areas reduced by some 6 million hectares (around 20% of the total forested acreage that existed in 1859). From this perspective, it seems appropriate to ask to what extent the property rights established over the Spanish woodlands influenced this process.

In the course of the nineteenth century, Spain underwent a profound and complex redefinition of property rights over land, which in a general way was very similar to what was happening in the rest of Western Europe. During the process, more particularly, the property rights specific to a feudal system were substituted by a new structure of rights that gave greater emphasis to individually held (private) property and to State-held property. Thus, from the middle of the nineteenth century, the majority of Spanish forest land was subjected to either of two legal types of ownership, a situation that continued into the twentieth century. On the one hand are the private forests, which have been managed by their owners with a high degree of freedom, albeit theoretically subject to of use imposed by changing forestry regulations. On

the other hand are the public forests (State- or village-owned), in respect of which the State has attempted to establish regulatory systems in order to control their use. This legal situation hides a more complex situation, as each category may include diverse combinations of rights of use of the forests. However, analysis allows us to evaluate whether the environmental effects of private management differ from those of public management.

In Spain, the debate about the environmental effects of forest property regimes is currently focused on public forests. Certain works, such as those by Bauer (1980), who accepts (although not explicitly) the approach by Hardin (1968) about “the tragedy of commons”, are very critical of the historical forms of the common management of forests and support the notion that, since the mid-nineteenth century, it has been State management and, more precisely, the actions of the forest engineers linked with forest administration that prevented greater destruction of these natural spaces. In similar fashion, the works by Gomez Mendoza (1992), Gomez Mendoza & Mata Olmo (1992) and Manuel (1996) undertake a positive valuation of the Spanish States’s historical management of public forests, emphasizing the work aimed at their conservation put in hand especially during the second half of the twentieth century. Conversely, other works, such as those by Cruz *et al.* (1992), Ortega (2002), Serrano (2005), and Soto *et al.* (2007), raise the point that historical community management of forests had a sustainable nature, and that it was precisely the process of forest community deregulation and State intervention, begun in the mid-nineteenth century, that introduced norms and incentives leading to resource over-exploitation. In the same sense, the works by Rico (2001 and 2003) and Carpintero (2005) support the idea that, throughout the twentieth century, State intervention in respect of forests was aimed mainly at increasing their economic production, neglecting key environmental aspects. Forest repopulation with fast-growth species, carried out during the Franco era, is the most outstanding example of such management focused on economic productivity.

Within this general context, the present work attempts to join the debate by analyzing the evolution of timber exploitation in Spanish forests throughout the twentieth century. Its main contribution is that, for the first time, it uses a long-term indicator (covering the entire twentieth century) that permits an evaluation of the timber-exploitation results in private forests and compares them with those of publicly administered forests, in order to establish the differences between the two kinds of management. The main hypothesis upon which this comparison is based rests on of authors such as Ostrom (1990) and Hanna and Munasinghe (1995). From their viewpoint, the generic regime of property (public or private) is not deterministic in the evaluation of the relationship existing between property rights and environment. They suggest that the

most deterministic aspects are the incentives and particular norms regulating access to resources within those regimes. From such a viewpoint – provided the norms are well-defined – any set of property rights may guarantee a sustainable use of resources, but may not do so if well-defined norms are not in place.

The paper is divided into five sections. The second section explains both why timber exploitation is an appropriate indicator to analyse the problem raised, and how the evolution of timber exploitation can be interpreted in Spain from the environmental point of view. The third section shows the basic forms of property rights established over Spanish forests and traces their development over the long term. The fourth section analyzes the evolution of timber exploitation in public and private forests, and also attempts to formulate an initial approach to conservation in both cases. The final section gathers some initial conclusions and directions for future research.

II. Timber exploitation as indicator

Timber has traditionally been considered by forest technicians to be the forest raw material *par excellence* (Zapata, 2001), so that it can be said that the historical development of forests is determined to a large extent by timber consumption. Within this general context, several recent studies (Iriarte-Goñi & Ayuda, 2007; Iriarte Goñi, 2008) have made scope for the reconstruction of Spanish timber consumption – measured in physical units (cubic metres with bark) – for the entire twentieth century, via an estimation for the 1900-1935 period and through the use of official information sources for the 1946-2000 period¹. Data from such reconstruction are presented in Figure 9.1, which shows the evolution of Spanish timber consumption

¹ The lack of official statistics regarding timber consumption and extraction for the entire twentieth century requires data reconstruction through different methods, according to different periods. For the period before the Civil War, the lack of official statistics regarding timber production and consumption has been offset with estimates. To that end, we have followed the method used by ZAPATA (1998 and 2001), who followed ROBERT (1957), although we have adjusted the coefficients used by both authors to elaborate a long-term continuous series: IRIARTE & AYUDA (2006 and 2007b), so that we have taken only its last part, which corresponds to the first third of the twentieth century. Imports and exports for this first period have been extracted from the Spanish Foreign Trade Statistics for the years between 1900 and 1935. From such figures, we have calculated national extractions according to the following formula:

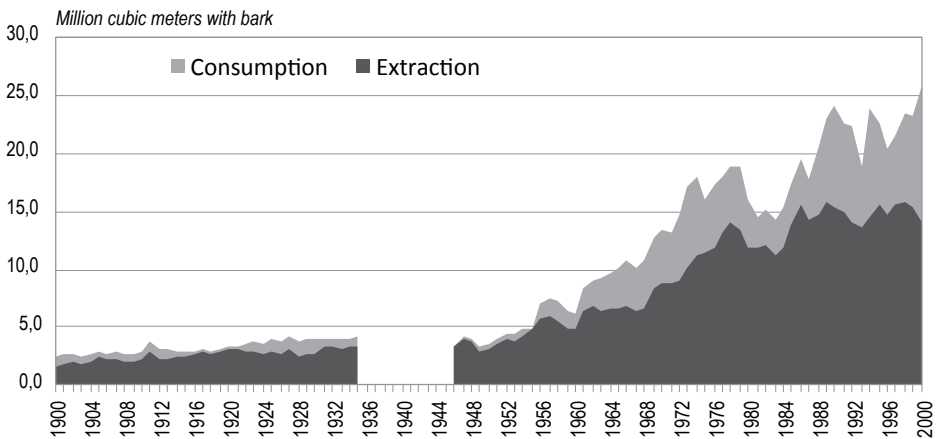
$$\text{Extractions (1900-1935)} = \text{consumption} - \text{imports} + \text{exports}.$$

For the period after the mid-1940s (1946-2000), the calculation method is different, since it takes as base those data regarding total timber production and the data of Spanish foreign trade in timber. Both groups of data have been extracted from the Spanish Forest Statistics (for the years between 1946 and 1971) or from the chapters devoted to forests in the Yearbooks of Spanish Agrarian Production (for the years between 1971 and 2000). The figures contained in these sources have been corrected according to the method proposed by GEHR (2003). Timber consumption has been calculated according to the following formula:

$$\text{Consumption (1946-2000)} = \text{extractions} + \text{imports} - \text{exports}.$$

(upper line), the evolution of such raw material in Spanish forests (lower line) and, by default, the evolution of timber imports (shaded area). As can be observed, timber consumption in Spain increased almost tenfold between 1900 and 2000. Moreover – although especially in the final decades imports accounted for a certain degree of that increasing consumption – Spanish timber production multiplied sixfold over this long period, from barely 2.5 million cubic metres in 1900 to approximately 15 million cubic metres in 2000.

Figure 9.1. Evolution of timber consumption and extraction as raw material in Spain, 1900-2000



Sources. See footnote 83. Personal compilation.

Table 9.1 compares the evolution of timber consumption in several European countries between 1929 and 2000, and shows the impressive increase in Spanish timber extraction in the twentieth century. In the initial period, Spain contributed around 9.5% of the total amount of timber of the countries considered in the sample; by 1991, that proportion had exceeded 20%. As regards timber production, Spain thus became second only to France among the countries considered in the sample.

In short, timber exploitation of Spanish forests underwent considerable growth in both Spanish and European terms. This suggests that intervention in Spanish forests had had to be intense and seems to justify the adoption of this variable as a very appropriate indicator to gauge the environmental effects of different property regimes.

Table 9.1. Timber extraction in different European countries, in 1929 and 1991

	Millions of m ³		Growth		Percentage	
	1929	1991	1929	1991	1929	1991
France	24.2	28.2	100	117	53.0	43.7
Italy	12.0	9.0	100	75	26.3	14.0
Portugal	5.3	7.5	100	142	11.6	11.6
Spain	2.7	13.0	100	483	5.9	20.2
Great Britain	1.3	4.3	100	331	2.8	6.7
Greece	0.2	2.4	100	1263	0.4	3.7
Sample total	45.7	64.5	100	141	100	100

Sources. 1929, LLEÓ (1929), IRIARTE & AYUDA (2007b); 1991, PRADA BLANCO (1991); personal compilation. Figures from 1929 should be considered as provisional, since they ought to be compared with other international sources from that time.

The environmental impact produced by this great increase in timber exploitation is difficult to evaluate using the available data. However, in noting the expanse and quality of the forests, it is possible to attempt an approximate assessment. Regarding expanse, in a country like Spain, which has been subject to severe processes of erosion and even desertification, the reduction in forested lands is logically considered to be negative. This negative judgement could even be extended to include many cases where the disappearance of forests has resulted in an increase of cultivated land. In fact, much of the land cultivated at the expense of forests is less than ideal for agriculture, providing very low yields per hectare and aggravating the problems of erosion and degradation of the soil (Elorrieta, 1931; Ortega Hernandez-Aguero, 1989). The subject of the quality of forests is even more complex and difficult to evaluate (Ibero & Dudley, 1995), but the kind of reforestation carried out over time can be considered an indicator. In this sense, reforestation with native species well adapted to the territory and maintaining the biodiversity of the woodland could be considered more suitable than mono-specific reforestation applied over large areas, with rapid-growth species designed for timber production. In short, the evaluation of the environmental impact of timber exploitation on both public and private forests depends on how the area evolved and on the reforestation with one or the other species.

III. Forest property systems in Spain

The issue of property rights in Spain from the beginning of the nineteenth century has been widely studied by economic historians in recent years (Congost, 2006; Jimenez Blanco, 2002). Regarding forests, we know that a complex process of

redefinition of property and rights of use was characterized by a double trend. On the one hand, between 1859 and 1900, approximately 3.97 million hectares of forest were privatized in Spain (GEHR, 1994). On the other hand, those forests that did not become private were subject to considerable changes, in which local councils and the State –as institutions strengthened after the nineteenth-century liberal reform – achieved a high degree of regulation over forests. In general terms, such changes ended up generating two types of legal property regime in forests, denominated as private and public, although such denominations could involve very different situations within each category (see Table 9.2). In fact, in both public and some private forest, there was a continuing rights-of-use overlap (a concurrence of rights) with different actors and institutions involved in forest exploitation. In parallel, there was also a process of progressive hierarchization of the rights of use, which led to some rights (and the actors involved) predominating and to others being subordinated (Iriarte & Lana, forthcoming).

Table 9.2. Forest property systems in Spain

<i>Property system</i>	<i>Owners</i>	<i>Main management system</i>	<i>Main decision-making systems</i>
PUBLIC	State	Public utility	Shared decisions: State/municipalities/ communities/individuals
	Villages	Local control	
PRIVATE	Individuals	Contracts	
		Private control	Individual decisions

Note. See Tables 9.3 and 9.4 for more details.

Public forests were those that remained in the hands of one or other public institution, especially the State or village councils. Among them, three main groups can be distinguished, according to the hierarchization of rights established. First come the State forests, which were those previously a part of royal domains and which were later extended through State purchases. From 1901 on, all State forests were declared to be public-utility forests, which stemmed from the assumption by government that it had a positive influence on environmental conservation². In many of these forests, it could be that use rights were exerted by some neighbouring communities, although the decision-making process had traditionally been within the competence of the State

² From the middle of the nineteenth century, the Spanish forest engineers had defended the importance of wooded forest in the prevention of floods and landslides and also their influence in rainfall and climates regulation (ICONA, 1987 and 1993).

Forest Administration³. Secondly, there were the woodlands that fell mostly within the boundaries of forest villages and that were owned by municipalities, but supervised by the State. This group, too, was declared to be of public utility from 1901 on, for the same reasons as the State woodlands had been. In these spaces, local communities had traditionally enjoyed a wide range of use rights, although – due precisely to their character – they had been subject to the supervision of the State Forest Administration. The basic form of operation had been that local councils requested specific uses for each year, and the State Forest Administration approved or disapproved the requests after studying their feasibility. The third group, finally, consisted of ‘free disposition’ forests: that is, those forests owned by local councils, but not considered of public utility, whose exploitation could be freely decided on by councils. Most of them were unwooded spaces, traditionally devoted to fodder for cattle.

Private forests, on the other hand, were much more homogeneous. Although in some of them certain rights of way or even community obligations may still have existed, decisions regarding their exploitation came within the competence of a private individual or company and, unlike public forests, they were not shared. During the nineteenth century, within a liberal economic context, there were no restrictions on the use of private forests, which were managed or transformed into cultivated fields in total freedom by their owners, though this situation began to change, at least nominally, in the early years of the twentieth century. From 1908 on, a series of laws was established that focused especially on the prohibition of total deforestation without supervision by the State (Fenech, 1917). Although this type of regulation remains to be analyzed in depth, it seems that the ability of the State to detect abuses and force compliance with the restrictions was very limited, and that consequently the freedom of use by owners continued to be quite substantial during most of the twentieth century. It was only in the 1980s that regulations governing the use of private woodlands and the monitoring of compliance with them gained greater strength as the supervision of woodlands passed from the central government to the Autonomous Regions (Fernández García, 2004).

The exception to this general behaviour was represented by the *montes concertados* (referred to further as ‘forests under contract’); these were contracts concluded between the State and some private individuals in the 1950s. By means of them, owners of woodlands shared decisions with the State over timber exploitation and the required reforestation. The granting of economic assistance for exploitation and reforestation depended on compliance with the norms established in the contracts. Forests of this type, despite being held in private hands, can be considered to be

³ Since 1986, forest statistics have integrated within the same group of State forests the forests that are the property of the Government of the various Autonomous Regions of Spain.

shared-management areas, seemingly more like the system of public ownership than the system of the strictly private, since their use was very much determined by public decisions (see column 4 of Table 9.1).

Following the development of these different combinations of property rights through the twentieth century is complex, since the information sources available have in many instances changed their classification criteria. For the period between 1900 and 1972, forest statistics show the evolution of total forest area (wooded and wooded forest), disaggregated by different kinds of property. Since the 1970s, however, such statistics included only the data from the National Forest Inventories (IFN1 and IFN2), which did not disaggregate property kinds for all forests, but only for those wooded. Despite the difficulties involved with these statistics, Tables 9.3 and Table 9.4 allow us to follow the evolution of forests according to nature of property.

Table 9.3. Composition of forests according to nature of property

<i>in hectares</i>	1900	1935	1955	1972	1995
State (1)	295,247	367,360	545,000	830,000	
Villages (2)	7,223,014	6,707,175	7,282,000	8,854,000	
Total Public (1 + 2)	7,518,261	7,074,534	7,827,000	9,684,000	
Private (3)	22,524,119	19,007,645	18,601,000	16,780,000	
Total (1 + 2 + 3)	30,042,380	26,082,179	26,428,000	26,464,000	27,459,478
	%	%	%	%	%
State	1.0	1.4	2.1	3.1	
Villages	24.0	25.7	27.6	33.5	
Total Public	25.0	27.1	29.6	36.6	
Private	75.0	72.9	70.4	63.4	
Total	100.0	100.0	100.0	100.0	100.0

Sources. For 1900 and 1935, GEHR (1994); for 1955 and 1972, Spanish Forest Statistics for each year; for 1995, IFN2 (1996).

As can be seen in Table 9.3, a significant reduction in forest area took place during the first third of the twentieth century. This reduction can be explained by the great expansion of the cultivated area, which occurred throughout the whole country during this period (GEHR, 1994). The reduction affected mainly private forests, which shrank by almost 4 million hectares (13% of the total in 1900). Also contributing to the diminution was the limited ability of the State to enforce the laws passed since 1908. Public forests, on the other hand, were subject to a series of norms that hindered their cut-out and ploughing, and that, in general terms, prevented their disappearance.

In the subsequent period (1935-1972), the trend changed, the total forest area ceasing to decline and even showing a slight recovery, albeit that its composition according to kinds of property continued to alter. The shrinking of private forests progressed further, although at a pace slower than in the preceding period. Such a reduction may be explained by both the adoption of more powerful agrarian machinery, capable of cultivating previously marginal land, and the expansion of urbanization processes due to the growth of city centres and tourism during the 1950s and 1960s. In parallel, within the context of the Franco regime, public forests tended to expand consequent on the purchases undertaken by the *Patrimonio Forestal del Estado* (National Forest Heritage), as well as by the recovery of lands developed by local councils⁴. The depopulation process that took place in many mountainous areas during the 1960s (Collantes, 2004) may have contributed to such land recovery by local councils.

Table 9.4. Composition of wooded forests according to kinds of property

	IFN1	IFN2	IFN1	IFN2	IFN1	IFN2
	<i>Hectares.</i>		<i>Index</i>		<i>Composition</i>	
State	471 768	825 694	100	175	8	5.9
Public	2 70 600	2 565 894	100	118	18.4	18.5
Under agreement	1 331 339	1 438 418	100	108	11.3	10.3
Public + Agr.	3 973 707	4 830 006	100	122	33.7	34.7
Private	7 817 891	9 074 654	100	116	66.3	65.3
Total	11 591 798	13 904 660	100	118	100	100

Sources. IFN1 (1976) and IFN2 (1996).

Note. *The hectares in this table differ from those in Table 9.3 (columns 1972 and 1995) because, as explained in the text, the National Forest Inventory of the 1970s and the 1996 included only wooded forest, that is forest with mainly tree cover.

The data available on wooded surface for the last quarter of the twentieth century (Table 9.4) seem to show a clear trend of change vis-à-vis previous stages. Between the 1970s and the 1990s, in fact, there was a clear tendency for both the total forest surface and the wooded surface to increase. Furthermore, this expansion took place across the entire range property types, albeit that it was much more intense in State forests (data for this also included forests owned by the Autonomous Regions), which appear to have enjoyed a significant increase in surface area and reforestation. That said, the wooded surface had also expanded – although more moderately – in the remaining forests, including private ones. The main explanation for such change

⁴ A part of such recovery is in fact very likely to be simply statistical; that is, that the area of villages forests grew due to the application and use of more advanced measurement systems.

can be found in the application of the Common Agricultural Policy (CAP) to Spain and, more generally, of the various directives of the European Union (EU). Agrarian re-conversion, which accompanied the integration of Spain into the EU, may have influenced the abandonment of cultivation of less profitable lands. At the same time, grants to convert agrarian production lands into forest production areas also provided a relevant incentive (Sumpsi, 1991). The internal political decentralization that took place in Spain in the 1980s meant that the administration was more amenable to measures favouring forest conservation and regeneration (Fernandez Espinar, 1991).

To sum up, one could say that, throughout the twentieth century, the Spanish State tried to increase its ability to manage woodlands, doing so by means of three complementary channels. First, the establishment of the concept of public utility in most of the public woodlands created a legal framework that allowed the State to intervene directly in decisions about their use, negotiating with other entities (towns and communities). Secondly, the conclusion of agreements with some private owners in the second half of the twentieth century made a significant State presence possible in the decision-making process regarding the woodlands concerned. Finally, through the establishment of forest laws, the State also attempted to in decisions on private woodlands, albeit less directly. So, how did all this translate into the management of timber exploitation?

IV. Timber extraction and reforestation

Once we have observed the evolution of forest surface according to property regime, we can analyze timber exploitation, with the aim of assessing how different generic kinds of property responded to the increase in extractions. In this sense, the available information sources offer more systematized information covering the entire century; from an estimation for private forests between 1900 and 1935, it is possible to extract an annual series of disaggregated production as between public forests and those under agreement with the State, on the one hand, and private forests, on the other. Table 9.5 provides a summary of such information, showing the rates of annual growth and the percentage composition of the extractions. The basic difference between them can be found in the process of decision-making regarding forest exploitation. Whereas in most private forests decisions were individual and could be made with very few institutional restrictions, in the case of public forests and those under contract, there were specific legal channels to follow, apart from the fact that the institutional levels involved in decision-making were peopled by various actors.

If we focus on the case of public forests and those under contract, we can see that extraction increased at a good pace from the beginning of the century until the end of

the 1970s, although different stages can be differentiated. The especially strong growth of extraction between 1900 and 1935 (more than 6% annually) may be explained as a result of the forest regulations put into practice since the end of the nineteenth century (affecting some forests of public utility, both State and municipal), in order to meet the growing demand for timber from the urban and industrial centres. Although the number of forests falling under this regulation never exceeded 10% of total forests, the forestry treatment to which they were subjected greatly accelerated extraction, so that extraction far exceeded that of the public forests (Iriarte-Goñi, 2005). After the First World War, however, the pace of extraction in public forests slowed, probably due to the fact that regulations were weakened by legislative changes, even though rates of growth were clearly maintained above 2%⁵.

The strongly authoritarian political regime that emerged after the Civil War and that held Spain in its grip between 1939 and 1975 brought considerable changes in the exploitation of Spanish public forests. The Franco regime deployed an autarchic policy during its first years and, as in many other sectors, it attempted to achieve timber self-sufficiency and thereby avoid having to resort to imports. With that purpose, it applied a policy that has been described as productivist (Rico, 2001; Carpintero, 2005) and, as can be observed in Table 9.4, very significantly increased extraction from public forests and those under contract during the 1940s, 1950s and 1960s. The increase turns out to be really impressive if we take into account that the timber from those forests represented 8.6% of total extraction prior to the Civil War, and somewhat more than 29% in the 1970s.

These figures show how the Francoist State had the capacity to develop a forest project in public forest, whose main objective was to increase timber production. To this end, the Francoist regime developed a large-scale reforestation programme that in many cases represented a severe constraint on the traditional uses of the forest by local communities. The coercion capacity of the Forest Administration within the authoritarian framework of dictatorship, and the weakening of rural communities caused by both repressive policies and rural exodus in many mountainous areas, may explain such trends. On the other hand, we know that, from the 1950s on, contracts for replanting had been concluded between the National Forest Heritage and several owners, especially in those areas in which companies to do with ground timber for board and paper-pulp manufacture had been established (Rico, 2001 and 2003; Ortega Hernandez-Agüero, 1989). It seems logical to think that this reforestation programme would have produced a profit since the mid-1970s (that is, tenor twenty years after getting under way), favouring the increase of extraction in forests under

⁵ Regarding forest regulations in the first third of the twentieth century and their productive effects, see IRIARTE GOÑI (2005a).

contract. Subsequently, the end of the Franco era coincided with a clear reduction of growth rates from the mid-1970s on in extraction from public forests and those under contract, turning negative from the 1980s until the end of the century. This suggests very important changes in the understanding and application of forest policies within these spaces, coinciding with the establishment of democracy and the development of the model of Autonomous Regions. Although this issue should be analyzed through a study of the policies developed by the various autonomous Regions, which received powers related to forests, everything seems to point to the fact that, within this new political framework, conservationist criteria prevailed over productive.

Table 9.5. Growth rates and percentage composition of timber extraction as raw material in public and private forests

	Growth rates			Composition (%)		
	<i>P & Cont.</i>	<i>Private</i>	<i>Total</i>	<i>P & Agr.</i>	<i>Private</i>	<i>Total</i>
1900-1913	6.22	1.63	2.00	7.8	92.2	100
1914-1919	2.96	3.22	3.20	8.1	91.9	100
1920-1935	2.64	0.38	0.64	8.6	91.4	100
1935-1946	4.39	-0.51	0.35			
1946-1955	4.38	2.03	2.52	22.6	77.4	100
1956-1963	5.12	0.20	1.44	26.1	73.9	100
1964-1975	1.95	5.52	4.54	29.1	70.9	100
1976-1985	-0.80	2.36	1.60	22.6	77.4	100
1986-2000	-1.30	-0.54	-0.69	18.7	81.3	100
1900-2000	3.32	1.96	2.11	20.3	79.7	100

Sources. for 1900-1935, IRIARTE & AYUDA, (2006); for the rest, Spanish Forest Statistics; personal compilation.

Note. P & Cont. = Public and under contract.

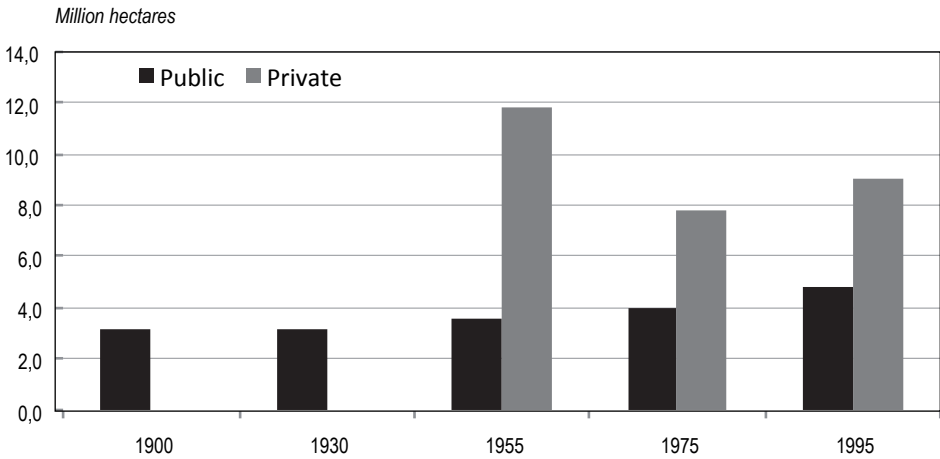
Regarding private forests, extraction shows much more irregular behaviour, which to a large extent seems to respond to market-generated impulses. In fact, some of the periods during which private extraction grew the most were those in which forest prices were more clearly profitable, that is the years corresponding to the First World War (GEHR, 2002; Sala, 2003) and the final period of autarchy – 1946-1955 – (GEHR, 2003). In spite of this, timber extraction from private forests reached its maximum rate (higher than 5% annually) in the final years of the Franco era, a time when, as has already been pointed out, forest prices declined in relative terms. This situation could be related to the development of Spain’s timber grinding industry (to obtain cellulose

or paper pulp) and the economic policies (not solely related to forestry) linked to the development of these industries within the framework of Francoist *desarrollismo* (fast economic development). Although this is an issue which has not yet been analysed in depth, it can be argued that, since the 1970s, economic policies may have offered private individual owners of forests a series of incentives to promote planting and exploitation of fast-growth tree species, devoted to timber production for grinding purposes. Thus, for instance, forest owners were offered the possibility of advantageous credits for replanting with fast-growth species (Tejada Gonzalez, 1969), which coincides with an increase of replanting in private forests, especially throughout the 1960s (Sumpsi, 1991). In short, there have been incentives that may explain why private initiative had greater predominance in timber extraction from the 1970s on, rather than public forests which, since the transition to democracy, seem to have been relegated to playing a secondary role in timber extraction.

Information to hand, albeit incomplete, may provide us with certain evidence to help us appreciate the effects that such exploitation had on forests. First is information about the evolution of the wooded surface, which, in the case of public forests, can be reconstructed for the entire century and, in the case of private forests, for the period since the 1950s. Figure 9.2 shows the evolution in both cases, and how the wooded surface of public forests has grown almost constantly, whereas that of private forests has been subject to more alterations, with a trend towards shrinkage during the 1970s, and subsequently a recovery. Although these figures need to be refined, they suggest that timber exploitation in public forests and in those under contract was accompanied by a replanting process which, as a whole, achieved an expansion of the surface area of forests. However, the absence of replanting programmes in private forests, at least in the 1960s and 1970s, may have produced a loss of forest mass. This agrees with the information in Figure 9.1, and suggests that the private property regime was more likely to result in forest disappearance.

For the period after the 1950s, it is also possible to see the evolution of this surface area, disaggregated into the main tree species. This issue may turn out to be important, since it allows reconstruction of the introduction into Spanish forests of fast-growth species linked to timber exploitation, which in general terms can be associated with a productive forest of inferior quality to that of autochthonous species (Ortega Hernández-Agüero, 1989). In this sense, Table 9.6 shows the evolution of the three periods for the four fast-growth species most widely used for replanting purposes, disaggregated according to property regimes.

Figure 9.2. Evolution of wooded surface



Sources. GEHR (1994); Spanish Forest Statistics (1955); IFN1 (1976) and IFN2 (1996).

Table 9.6. Evolution of hectares with fast-growth species, and index of growth (1959 = 100)

	Forests of Public Utility			Private Forests		
	1959	1975	1999	1959	1975	1999
P. Pinaster	300,007	568,107	414,837	481,842	639,837	775,963
P. Radiata	6,082	82,295	49,910	81,227	159,337	162,458
Eucalyptus	25,694	72,349	26,955	93,128	115,538	372,493
Poplar	1,698	5,622	7,832	140,578	63,396	77,738
Sum	333,481	728,373	499,533	796,775	978,108	1,388,652
<i>Index (1959=100)</i>						
P. Pinaster	100	189	138	100	133	161
P. Radiata	100	1,853	821	100	196	200
Eucalyptus	100	282	105	100	124	400
Poplar	100	331	461	100	45	55
Sum	100	231	150	100	133	174

Source. Spanish Forest Statistics for each year.

Note. P. Pinaster= *Pinus Pinaster*; P. Radiata= *Pinus Radiata*.

As can be seen, the existing differences between forests of public utility and private forests are not radical, since in both types of forest the space devoted to fast-growth species expanded throughout the second half of the twentieth century. Nevertheless, this shared trend was not synchronous and there were differences regarding the rate and the species introduced. In the case of public forests, the huge increase that took place in the 1950s and 1960s is striking, coinciding with the high level of production achieved during the Franco era that we have already seen in terms of timber extraction. The main emphasis was placed on the *pinus radiata*, a species that adapts well to the climatic conditions of Mediterranean woodlands and that is especially suitable for the production of ground timber. It is also clear that, in the most recent period, the production trend slackened somewhat, since the figures corresponding to all fast-growth species (except the poplar) tended to be on the decline. In other words, since the end of the Franco era, replanting programmes largely abandoned fast-growth species, in order to re-establish traditional autochthonous species. Problems related to the forest plague that affected the large plantations of *pinus radiata*, as well as forest fires, especially significant in coniferous woodlands, could have been behind those decisions.

In private forests, on the other hand, reforestation with fast-growth species began only some time later, although it has continued at a gradually increasing rate up to the present time. It may be inferred from this that the planting undertaken in public forests might have set the scene for the reforestation of private forests, in the sense of the years of knowledge and experience that were passed on to the private owners. Of course, the continuous expansion of this type of reforestation beyond the 1970s can be explained by the business opportunities that the sale of this kind of wood offered private forest owners, as is borne out by the increase in the quota of timber extraction from private woodlands in the most recent period (see Table 9.5). The species with the greatest growth rate – greater even than that of the *pinus radiata* – is the *eucalyptus* (blue gum tree), which posted a fourfold increase in size between 1959 and 2000 and which is also especially suitable for the production of wood destined to be ground. On the other hand, it is the species most criticised by the ecological movement in Spain, due to the detrimental effects that it has on the soil (acidity, loss of nutrients, erosion), as well as its being a fast-spreading species that can generate losses of biodiversity. Scientific studies regarding this are not conclusive (Sisa, 2004); in any case, it seems that environmental claims have had a greater resonance in public forest administration than in private management.

V. Concluding remarks

Although there are still many aspects to be researched in greater depth, the trends observed so far allow us to suggest certain provisional conclusions, albeit that these have to be confirmed, clarified and extended.

First, the long-term viewpoint strengthens the idea pointed out in a previous paper (Iriarte & Lana, forthcoming) for the 1860-1935 period, which is now confirmed for the entire twentieth century: *i.e.* that the different forms of concurrence of rights (the overlapping of the rights of use of various actors and institutions involved in forest exploitation) were a constant, and even grew in importance in surface terms; since the 1950s, and through different contracts, this has included private forests. This concurrence was accompanied by changes in the hierarchy of rights of use, which benefited mainly the State, so that the Forest Administration progressively gained the capacity to establish criteria for timber exploitation, both in forests of its own and in the majority of village forests and those under contract. At the same time, the State also established forest laws in an attempt to influence use in the remaining woodlands.

Within this context, and in accordance with the approaches of Ostrom (1990) and of Hanna & Munasinghe (1995), it can be said that two distinct systems of incentives and regulations were established, each having different environmental effects. In the case of woodlands subject to direct public intervention, the State put a series of rules in place that attempted to make conservation and the increase of forested area compatible with the increase in timber production. However, this combination went through different phases, determined by the composition of the State itself and by its own general objectives. In the first third of the twentieth century, environmental and productive criteria remained fairly balanced, unlike the situation during the Franco era when the predominant economic criteria were linked especially to the development of industries producing ground timber. Finally, in the last two decades of the century, environmental criteria predominated, tending more toward conservation. Against this background, it is obvious that no deforestation process took place in forests under public intervention, which, on the contrary, gained in surface terms. However, the strong growth of timber extractions during the Franco era forced the development of reforestation processes with fast-growth species, which are very likely to have affected the environmental quality of the forests. In this sense, it should be pointed out that the great political changes that took place in Spain in the transition from a dictatorial centralized system to a decentralized democratic system coincided with a quite radical change in both timber extraction and reforestation policies, which confirms that State management may vary according to the particular norms it enforces.

Regarding private forests, it can be emphasized that the attempts of the State to regulate their use by means of forest laws were by and large failure. This was probably due to the lack of available human and material resources to enable the enforcement of compliance with the regulations established. This lack of institutional control resulted in the disappearance of a considerable amount of private forest between the beginning of the century and the 1970s, a development that was involved in the decrease in the biodiversity and that in some cases could be related to losses of soil and to desertification. It remains clear that strong individual property rights, if not accompanied by other institutional arrangements, do not guarantee good environmental outcomes. Rather, it seems that private initiative is related to market impulses, which in the Spanish case resulted in a mass loss of private forest during the first three quarters of the century, and in an increasing specialization in timber-productive forests from then onwards.

In any case, a relevant lesson to be learned from this long-term viewpoint is that environmental trends do not necessarily move in the same direction, but may vary according to changes in economic, social and political contexts. Surface recovery in private forests and the reduction of fast-growth species in public forests during the last decades of the twentieth century, are good examples of this. The environmental effects of these changing trends should be monitored in the future.

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